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ERRATA

VOLUME XXXV

page 451 line 46 for 'University of Hawaii, Honolulu' read 'University of California, Davies'

VOLUME XXXVI

157	10 for 'curly top' read 'leaf curl'
159	23 insert '[beet]' before 'curly top virus'
330	6 for '1956' read '1957'
852	32 (second column) for 'Cacao leafless twig in Indonesia, 638' read 'Cacao leafless twig in the British Cameroons, 638'

VOLUME XXXVII

20	30 for 'HARTZFELD (F. G.)' read 'HARTZFELD (E. G.)'
21	15 after '*Forsch. PflKr.*,' insert '*Kyoto*'
29	38 for '[*U. kolleri*]' read '[*U. hordei*]'
48	22 delete '[necrotic]'
157	25 for 'RICHARDS' read 'RICHARDSON'
160	27 for 'DUNIN (M. C.)' read 'DUNIN (M. S.)'
170	31 for 'RAABE (R. O.)' read 'RAABE (R. D.)'
177	35 for '*wortmanii*' read '*wortmannii*'
193	43 for '*Eokisehir*' read '*Eskisehir*'
197	47 for '*lacrymans*' read '*lachrymans*'
201	53 delete '[*U. tritici*]'
207	42 delete '*Glanerella cingulata*'
	43 after '*Colletotrichum coffeanum*' insert '[*G. cingulata*]'
215	48 for '*Dothidia*' read '*Dothidea*'
248	31 for 'PREUSS' read 'PEUSS'
260	15 for 'ASTHANA (R. D.)' read 'ASTHANA (R. P.)'
270	23 for 'ERMOLIEV' read 'JERMOLJEV' and for 'PRUSHA' read 'PRŮŠA'
282	34 for 'ATKINS (J. C.)' read 'ATKINS (J. G.)'
285	23 and 27, for 'flax' read 'cotton'
287	40 for '[**36**, p. 47]' read '[**37**, p. 47]'
	43 for '*cinammomi*' read '*cinnamomi*'
292	26 for 'MELIK-KHACHATRYAN (J. C.)' read 'MELIK-KHACHATRYAN (J. G.)'
297	23 for '*S. sarciniforme*' read '*S. botryosum*'
317	34 for '*Botrysphaeria*' read '*Botryosphaeria*'
326	16 put 'beet curly top virus' in inverted commas (' '); delete '[map 24]'
327	4 for '*lacrymans*' read '*lachrymans*'
331	47 for 'flax' read 'cotton'
332	32 for 'S. I. Moskovetz' read 'N. Moskovetz'
	32, 34, 35, 36, 40, 41 for 'flax' read 'cotton'
355	42, 45, 48 for 'flax' read 'cotton'
368	39 for '*Physalis florida*' read '*Physalis floridana*'

page 391 line 44 for '*Pennisetum typhoideum*' read '*Pennisetum typhoides*'
399 43 for '*Limum*' read '*Linum*'
410 49 for '*obconia*' read '*obconica*'
422 45 delete '[**30**, p. 293]'
444 10 for '527' read '327'
469 7 for 'Futrell (M. D.)' read 'Futrell (M. C.)'
485 1 for '*V. violae-tricoloris*' read '*C. violae-tricoloris*'
495 47 for 'pea mosaic' read 'pea mottle'
501 49 for '(tobacco ring spot)' read '(tobacco ringspot [tomato black ring])'
523 15 after '*Trichoderma lignorum*' insert '[*T. viride*]'
536 45 for 'Brazil' read 'Portugal'
570 37 for 'Raykov (E. B.)' read 'Raykov (E. V.)'
571 53 for '*lacrymans*' read '*lachrymans*'
572 48 for '*Entomphthora*' read '*Entomophthora*'
603 38 for 'Buchanan (W. B.)' read 'Buchanan (W. D.)'
649 4 for 'Garrett (D. S.)' read 'Garrett (S. D.)'
666 33 for '*Podosphaeria*' read '*Podosphaera*'
681 15 for '*Fusarium lycopersici*' read '*Fusarium bulbigenum* f. *lycopersici*'
686 41 for 'Berry (P. H.)' read 'Berry (F. H.)'
754 27 for '651' read '65'
765 45 for 'Wilcoxson (R. P.)' read 'Wilcoxson (R. D.)'

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RECENT PUBLICATIONS

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Review of Applied Mycology

VOLUME 37 · PART 1 · JANUARY 1958

Literature references in [ ] refer to the *Review of Applied Mycology*.
Map references are to the C.M.I. distribution maps of plant diseases.

KEYWORTH (W. G.). **Plant Pathology Report.**—*Rep. nat. Veg. Res. Sta., Warwick*, 7 (*1956*), pp. 60–64, 1957.

This report, covering Oct. 1955–Sept. 1956 [cf. **36**, p. 4], refers to further work on chemical treatments of crook root [*Spongospora* sp.] of watercress by J. A. TOMLINSON. Zinc frit (finely powdered glass containing 23% zinc oxide) liberated Zn slowly and suppressed the disease under laboratory conditions [**36**, p. 301]. In field trials stronger growth was obtained, with a considerable reduction of infection, by dusting frit on to the plants at ½ and 1 lb./sq. yd. after draining the beds (to prevent it being washed away), washing down, allowing the frit to settle, and then letting in the water again. Chlorine at 0·05–0·1 p.p.m. (the min. conc. attainable in practice) completely controlled the disease but was phytotoxic. Increase of the calcium bicarbonate content of the inlet water from 350 to 500 p.p.m. by charging the water with CO_2 and passing it through limestone chippings promoted vigorous growth with complete control of the disease, but the cost is uneconomic.

The same author reports that watercress mosaic virus [**31**, p. 526] can greatly reduce vigour and cropping capacity under laboratory and field conditions. In further tests transmission was obtained to petunia, *Gomphrena globosa*, and zinnia. The aphids *Brevicoryne brassicae*, *Aphis fabae*, and *Myzus persicae* were found to be vectors, but mustard beetle [*Phaedon cochleariae*], flea beetle [unspecified], and two species of froghopper [Cercopidae] found on watercress were not. The disease was not seedborne.

W. G. KEYWORTH and J. SHEILA HOWELL observed that between autumn and spring *Corynebacterium betae* [**36**, p. 158] can spread to red beet plants at least 25 yd. from the initial foci of infection, and often to much greater distances; steckling beds should be placed accordingly. In 1956 the disease affected at least 10% of plants in a seed crop of mangolds, making a potential new source of infection. Attempts to control spread by spraying the steckling beds with streptomycin, colloidal copper, or thiram were unsuccessful, but streptomycin treatment of seed (0·2% for 24 hr.) eliminated most initial infection, and coupled with isolation of stecklings reduced the disease very considerably. The incidence in treated crops was never above 3%, compared with 10–66% in untreated. The proprietary mercurial dust harvesan (1 lb./100 lb. seed), while not quite so effective as streptomycin, gave satisfactory control and is easy to obtain and use.

In further work on stem and fruit rot of outdoor tomatoes (*Didymella* [*lycopersici*: cf. **36**, p. 558]) by DOROTHY E. FISHER and J. M. WAY several fungicides were examined for their ability to prevent or to eradicate stem infection resulting from inoculation of leaf scars. Both for protection and eradication 3% formulations of various derivatives of dithane were best; captan (0·5%) and thiram (8%) gave good protection but were ineffective eradicants. Despite favourable

conditions no infection appeared in 315 plants grown from 3 batches of heavily infected and 1 of clean seed [cf. **36**, p. 138]. Overhead irrigation by oscillating spray lines increased the spread of *D. lycopersici* from artificially inoculated plants (10 and 12% secondary infection compared with 0 and 3% in control plots). A 3-year study of the infectivity of buried diseased material [cf. **36**, p. 735] indicated that tomatoes should not be planted again for 2 years after such burial. Of several species and varieties of *Lycopersicon* examined one strain of *L. hirsutum* var. *glabratum* showed high resistance to both stem and root infection [cf. **36**, p. 430].

A. G. Channon in further work on parsnip canker isolated *Itersonilia* sp. [**35**, p. 862] from infected roots from several localities by Wilkinson's method [**31**, p. 416]. The fungus readily enters wounded or unwounded roots and the purplish-brown to black, often orange-flecked, lesions produced resemble many naturally-occurring cankers. This fungus is apparently not associated with the pure orange or orange-brown lesions sometimes encountered, the cause of which is unknown. It is capable of infecting leaves, producing greenish-yellow spots, often with necrotic centres, but these are rare in the field. As before, the control of carrot fly [*Psila rosae*] by dieldrin had no effect on the incidence of canker in January.

In further tests of fungicides for the control of *Botrytis* [*cinerea*] on lettuce J. M. Way obtained good results on maturing frame plants with thiram and T.C.N.B. [tecnazene: **36**, p. 603]. Mercuric chloride or formalin soil treatment in the frames before planting out gave no control. In another test thiram, captan, P.C.N.B., and tecnazene were applied in 4 treatments to outdoor lettuce seedlings winter-grown under glass and planted out in March, the effect of treatment being assessed in May. The first 2 fungicides brought about a marked reduction of the disease, but the other 2 did not.

Thirty-seventh Report of the National Institute of Agricultural Botany, Cambridge, 1956.—60 pp., 1957.

In the mycological section (pp. 23–24) [cf. **36**, p. 175] it is stated that wheat yellow rust [*Puccinia glumarum*] was late appearing in 1956 and only traces of infection were found in SE. England. After the dry summer of 1955 barley loose smut [*Ustilago nuda*] infection was less severe in 1956 than in the previous 2 years.

A trace of black rust [*P. graminis*] was present on wheat, race 21 being identified.

The Potato Branch reports (pp. 25–29) that the new vars. Ulster Tarn and 480/50 showed high field resistance to both potato leaf roll virus and potato virus Y. Two strains of cucumber mosaic virus produced symptoms on 12 potato varieties [**36**, p. 176]. Tobacco veinal necrosis virus [potato virus Y (str.)] produced mild symptoms on most recommended potato varieties, but Ulster Prince and Ulster Premier gave necrotic symptoms. The effects on yield were less than those of more severe strains of virus Y and the susceptibility of varieties to the tobacco veinal necrosis strain was similar to their susceptibility to a common strain of virus Y.

In varietal trials the American Kennebec and Pungo were resistant to blight [*Phytophthora infestans*] races 0, 2, 2,4, and 4 and possibly to 3,4, Saco was resistant to 0, 2, and 4, while the remaining 5 American and 4 French varieties were susceptible to all the 9 races tested. In field resistance trials Saco was more susceptible to race 1, and Green Mountain, Russet Burbank, and Étoile de Léon to race 4 than King Edward, while Sebago, Waseca, B.F. 15, and Ker Pondy were more resistant than King Edward. Among British varieties Ulster King was more susceptible than King Edward, while the reactions of Ulster Beacon and Ulster Tarn were similar. Of 41 isolates of *P. infestans* from 18 varieties 29 were race 4, 8 possibly race 3, 7 race 1,4, and 4 race 3,4.

In further studies on the interaction of *Rhizoctonia* [*Corticium solani*] and *P. infestans* on potato tubers *C. solani* inoculated on tubers and on artificial media caused disorganization and the eventual disappearance of *P. infestans*. The addi-

tion of a liquid exudate from *C. solani* to a zoospore suspension of *P. infestans* caused cessation of movement and dissolution of the zoospore membrane in 30 min.

Plant Pathology Division.—*Res. & exp. Rec. Minist. Agric. Nth. Ireland*, **5** (*1955*), pp. 129–151, 1957.

In further work on potato blight [*Phytophthora infestans*] the dominance of race 4, noted in the previous report [**36**, p. 452], was confirmed when 70 of 73 isolates, from a locality growing many varieties (including many *tuberosum* × *demissum* hybrids), were found to belong to that race. The remaining 3, assigned to race 0, occurred on Arran Victory, Ulster Supreme, and British Queen. A total of 19 isolates was obtained from the hybrids, of which 6 (non-pathogenic) were not identified, while the remainder were assigned to races 1, 2, 4, 1,2, 1,4, and 1,2,4. In further work on dry rot of potato, *Fusarium caeruleum* and to a lesser extent *F. avenaceum* were found to be mainly responsible. *F. culmorum* and *Cylindrocarpon radicicola* also cause the condition on occasion.

To obtain further information on the spread of potato virus Y in Arran Pilot in the Moy area [loc. cit.] samples of 200–300 tubers from certified crops and from an infected crop in the area were compared with others from an outside area which customarily supplies the Moy growers with seed. The results stressed the risk of retaining stocks of this variety in the Moy area for more than a year. There was no evidence that insects transmitted the virus from tuber to tuber during storage. In devising measures against this disease consideration will be given to placing a limit on the number of years a stock of a susceptible variety can be retained for seed purposes in a district liable to serious infection; additional factors are the more rapid spread of the insect-transmitted Y virus as compared with the contact-transmitted X virus, and the difficulty in diagnosing the former. With the object of setting up virus-free clones from single tubers, half-tubers from apparently healthy plants were sprouted in the early year and scions from them grafted in duplicate to Epicure and Craigs Defiance. Of 135 half-tubers of seedling varieties and 71 of named varieties thus tested 11·8 and 11·4%, respectively, were found to be infected with mild virus, mainly virus X. Composite foliage samples from established single-tuber clones were examined by sap inoculation for X virus infection: Majestic (62·3% infection), Arran Victory (48·7), Ulster Prince (45·8), and Ulster Premier (35·1) were susceptible, and Gladstone (4·8), Ulster Chieftain (5·5), and Arran Pilot (12·6) less so. In mid-Oct. 1955 20% of a recently lifted and severely scabbed (*Actinomyces* [*Streptomyces*] *scabies*) crop of Stormont Dawn in County Armagh exhibited a very marked proliferation of the sprouts, with cauliflower-like growths up to 5 cm. diam., simulating wart disease, at the rose end of the tuber, those from the other eyes being smaller. It appears that soil, seasonal conditions, and cultural practice are all concerned in the occurrence of bud proliferation at the time of lifting. Skin necrosis, a condition of uncertain etiology seldom prevalent in Northern Ireland, caused 15% loss in one crop and was also present in others. Ulster Dale was affected for the first time. *Phoma* sp. and *Cylindrocarpon* sp. have frequently though not always been isolated from affected tubers, but never *P. foveata*, the fungus usually responsible for gangrene. This throws doubt on the contention of some workers that the fungi responsible for skin necrosis are the same as those causing gangrene [cf. **34**, p. 670].

In work on resistance of flax to *Fusarium lini* the highly resistant var. Redwing was crossed with other fibre varieties, and the resultant hybrids, together with back-crosses to the parent varieties, kept under observation. Six lines were accepted for the final field tests under farm conditions in 1951–55, and all gave a reasonably high yield of good fibre, though none equalled the susceptible varieties Liral Prince or Stormont Gossamer when grown on uncontaminated land. Neither of these, however, is satisfactory where there is wilt.

In examining oat seed for pathogenic fungi a modification of the Ulster method was used, the seed being immersed for 10 min. in 10% 'chloros' solution before plating on 2% malt extract agar, and examined after 6 days at 22° C. This modification was necessary because formerly the method tended to indicate a higher rate of contamination according to the length of time the grain had been stored, so that the contamination was usually underestimated if results were to be available before sowing time.

The mean percentage number of seeds contaminated with *Helminthosporium* [*Pyrenophora*] *avenae* (9·3) was the highest since 1948 (10·7). However, it is unlikely that the contamination was really worse than in the 2 previous years (5·3 and 6·4%, respectively, as estimated by the older method). The figure for infection by *Fusarium* sp. was 13·2%, being higher than in 1953–4 but lower than in 1950 and 1951 (13·9 and 15·3, respectively). Of the seeds examined in 1955 9·5% were contaminated with *F. nivale* [*Calonectria nivalis*], a pathogen usually associated with cold wet weather such as that which prevailed in 1954.

Flower distortion is fairly widespread in growers' stocks of indoor and outdoor chrysanthemums, but severe only where roguing has not been practised. No foliage symptoms have been associated with flower distortion or flower break except in the var. Roseverne, which exhibited distinct chlorotic areas on the leaves.

In the section on advisory work it is stated that damage to the seedling oat crop by *C. nivalis* was more prevalent than usual (see above), and a significant increase in the contamination of seed oats by this fungus was recorded. Brown patch (*C. nivalis*), dollar spot (*Sclerotinia homoeocarpa*), and red thread (*Corticium fuciforme*) have continued to give trouble on lawns and sports grounds.

Sun scald of apples, an uncommon condition in normal years in Northern Ireland, was frequent in July as a result of the hot, dry weather. Canker (*Nectria galligena*) was also prevalent, particularly on dessert apples. Plum canker (*Pseudomonas mors-prunorum*) continued to be troublesome.

Red core (*Phytophthora fragariae*) is now an acute problem in the strawberry-growing districts of County Armagh, where the problem will be to replace the susceptible var. Climax by another resistant to the disease and also free from 'June yellows'. One case of strawberry leaf blotch (*Zythia fragariae*) was noted. A number of cases of cane degeneration in raspberry plantations were caused by crown rot (*Nectria rubi*). Cluster cup rust (*Puccinia pringsheimiana*) was the commonest disease of gooseberry.

Twenty-two cases of foot rot (*Phytophthora cryptogea*) of tomato were recorded, the earliest sample being received on 20 Apr. An [unspecified] bacterial soft rot of tomato, hitherto confined to occasional plants and considered of little importance, occurred on a large scale. The first symptom is a blackening of the petioles of the lower leaves. The discoloration progresses towards the main stem, which collapses owing to the disintegration of the pith, after which the entire plant suddenly wilts. In a thick crop an inrolling, hardening, and purple discoloration of the young leaves may be the first symptom.

Among items recorded as of special interest were mildew (*Oidium* sp.) on dahlia seedlings in a glasshouse at the Plant Pathology Field Station; leaf gall (*Corynebacterium fascians*) of geranium [*Pelargonium*] in a propagating house in County Armagh; neck rot (*Ophiostoma* [*Ceratocystis*] *narcissi*) of daffodils in Counties Antrim and Down; and crown gall (*Bacterium* [*Agrobacterium*] *tumefaciens*) of garden beet in County Londonderry.

PHILLIPS (D. H.). **Report of the Mycological Department, 1955.**—*Rep. States Jersey, 1955*, pp. 31–42, 1957.

In this report [cf. **35**, p. 243] it is noted that more outbreaks than usual of *Verticillium* wilt (mostly *V. albo-atrum*) and common tomato mosaic [tobacco mosaic

virus] were observed on glasshouse tomatoes. One planting of peas was almost destroyed by downy mildew (*Peronospora viciae*). In early Aug. specimens of wheat unusually severely attacked by *Puccinia graminis* were received. Golden Harvest narcissus bulbs imported from the Netherlands were affected by basal rot (*Fusarium bulbigenum*).

In fungicide trials against tomato stem rot (*Didymella lycopersici*) [loc. cit.] to find a less dangerous alternative to ethyl mercuric phosphate, zineb and captan reduced losses by one-third while ethyl mercuric phosphate reduced them by two-thirds. In some circumstances the severity of stem rot was increased by applications of copper sprays used against blight (*Phytophthora infestans*). Zineb and captan may prove to be of use in the combined control of blight and secondary attacks of *D. lycopersici*.

In varietal resistance tests only the wild tomatoes *Lycopersicon glandulosum* and *L. peruvianum* showed any resistance to *D. lycopersici* [**36**, p. 430].

SALZMANN (R.). **Tätigkeitsbericht der Eidg. landwirtschaftlichen Versuchsanstalt Zürich-Oerlikon über das Jahr 1956.** [Report on the work of the Federal Agricultural Experiment Station Zürich-Oerlikon for the year 1956.]—*Annu. agric. Suisse*, (**58**), N.S. **6**, 4, pp. 303–371, 3 fig., 1957.

The following are among the items of phytopathological interest in this report [cf. **36**, p. 5]. Determined by the Igel-Lange test, the incidence of severe virus infection in 954 certified plots of class A potatoes (1955 harvest) was 2·5%. The application of the same test and the eye-cutting method resulted in the rejection of 17 stands, covering 10·5 ha., in addition to the 7·5% (as compared with 18% in 1955) already refused certification. The total area certified in German Switzerland in 1956 was 2,035 ha.

On the grounds of both efficiency and economy 2% Bordeaux mixture remains unsurpassed for the control of potato blight [*Phytophthora infestans*]. In general, the first treatment should be applied to susceptible varieties when the plants are just not touching and subsequent applications made at 10- to 14-day intervals in warm, damp weather and 3-weekly during a dry spell.

Septoria nodorum was shown to be the principal agent of leaf shrivelling and glume discoloration of wheat [**34**, p. 211]. In connexion with the project of breeding for resistance to brown rust [*Puccinia triticina*] 395 winter and 2,374 summer wheat plants (F_2 of the first back-cross) were inoculated in the greenhouse with a spore mixture of 50 strains. Adjudged to be resistant were 78 of the former and 320 of the latter group. Resistance to mildew [*Erysiphe graminis*] was also shown by 132 of the summer wheat plants. Of 960 single-plant progenies from 4 bulk lots inoculated with dwarf bunt [*Tilletia controversa*], 190 were selected as meriting further trials for resistance.

More than 14,000 plants were inoculated with clover rot [*Sclerotinia trifoliorum*: **27**, pp. 220, 479]. The percentages surviving stringent selection among the resistant (R_1) progeny and unselected indigenous material of the 1955 tests were 9·5 and 5, respectively. In another experiment 1,117 R_1 plants were tested in comparison with 951 unselected of the Leisi varieties. The former group comprised 11 survivors and the latter none.

Annual Report East African Agriculture and Forestry Research Organisation, 1956. —114 pp., 3 graphs, [? 1957].

In the section (pp. 44–53) dealing with plant improvement and protection [cf. **35**, p. 589], some of the information in which has already been noticed, L. R. DOUGHTY, D. L. JENNINGS, and D. W. GOURLAY state that the brown streak virus of cassava [**36**, p. 163] cannot be removed by any combination of time and high temperature not lethal to the plant. H. H. STOREY and A[UDRIE] K. RYLAND report that the field

breeding of locally adapted maize lines resistant to rust (*Puccinia polysora*) race EA. 1 [**36**, pp. 240, 523] is well advanced in Kenya, Tanganyika, and Uganda, and much of the material will also be resistant to race EA. 2, should it appear. F[RANCES] M. L. SHEFFIELD describes further studies of the stunted or mottled condition of sweet potatoes due to a virus. This exists in various forms, which fall into 2 groups with different insect vectors. Group A, causing a relatively mild disease, is carried by *Myzus persicae*, while group B, with very mild to very severe forms, is transmitted by *Bemisia tabaci*. In most sweet potato varieties A is indistinguishable from the less severe forms of B. To obtain known virus-free stocks clones have been developed from seedlings. That known as Muguga C seems to be a differential host of the two groups, A causing numerous, very small, discrete, chlorotic spots on it, while B induces a small mosaic pattern of greater or lesser severity. In cross-protection tests with *B. tabaci* as vector, infection with A appears to afford no protection against B, but mild forms of B appear to protect plants against infection with severe forms. It is therefore concluded that A and B are distinct viruses, and that the latter exists in a number of strains. All attempts to transmit A mechanically failed, distinguishing it from the virus causing feathery mottle in America [**34**, p. 174]. Severe forms of B sometimes cause the appearance of small, greyish areas in stored tubers and this may be the American corky spot [? internal cork virus: **25**, p. 289; **35**, p. 923, *et passim*].

Ipomoea alba, *I. purpurea*, and an ornamental allied to the latter were infected with virus A by grafting. Virus B was transmitted to the same hosts and to petunia by grafting with scions from infected sweet potato, by *B. tabaci*, and mechanically. *I. alba* is an almost symptomless carrier of both viruses. Mechanical transmission of B is difficult, and all attempts at such transmission to sweet potato failed. Virus B, though similar to and often accompanying cassava mosaic, was not transmitted from sweet potato to cassava by *B. tabaci*, nor could sweet potato be infected with cassava mosaic virus by the same vector. Attempts to inactivate B in sweet potato tubers by heat treatment in a moist atmosphere, by hot-water treatment, and by chilling were made, but the tubers invariably died before the virus was inactivated.

Annual Report of the Department of Agriculture, Uganda, for the year ended 31st December, 1956.—62 pp., 2 pl., 12 fig., 1957.

On pp. 27–29 [cf. **36**, p. 458] it is stated that only 6 out of 90 lines of the Muratha variety of maize proved homozygous for resistance to rust (*Puccinia polysora*) [**35**, p. 661]. Transference of resistance to the local var., K. 8, has continued.

Panama disease of bananas (*Fusarium oxysporum* f. *cubense*) [**36**, p. 457] was found in a new locality. The disease was relatively static in endemic areas.

Setts from various sugarcane varieties heat-treated against ratoon stunting virus disease showed a least significant increase of 13·8 tons/acre over the controls.

The causal agent of a widespread and destructive damping-off disease of flue-cured tobacco in the Gulu area was identified as *Pseudomonas solanacearum* var. *asiaticum*.

Annual Report of the Department of Agriculture, Ghana, for the year 1954–55.—53 pp., 1 map, 1957. 3*s*. 6*d*.

In this report [cf. **35**, p. 589] it is stated that Cape St. Paul wilt of coconuts [**35**, p. 448] continued to spread E. and W. of Keta, but attempts to ascertain its cause were unsuccessful. Coffee rust (*Hemileia vastatrix*) [**35**, p. 589] was widely distributed throughout Togoland, especially on the susceptible Niaouli and *arabica* coffees; damage was, however, slight. The work on cacao swollen shoot virus and black pod [*Phytophthora palmivora*] has already been noticed [**35**, pp. 428, 429, *et passim*].

Thirty-first Annual Report of the Department of Scientific and Industrial Research, New Zealand, 1957.—84 pp., 1957.

Research on plant diseases, fruit, and tobacco is covered on pp. 32–34 [cf. **36**, p. 517]. The perfect state of the fungus causing dry rot of swedes [*Phoma lingam*: **34**, p. 502] was found on plant residues of a number of brassica crops, the wind-borne spores probably spreading infection over long distances.

Forecasting apple scab [*Venturia inaequalis*: **35**, p. 353] might be feasible and profitable in New Zealand. Ascospore discharge, detected by spore trapping, occurred with nearly every rain shower in the spring of 1956 and was completed by the end of Nov. Spraying with phenyl mercury chloride after every period suitable for infection kept Dougherty trees free from the disease, but the same fungicide or sulphur in the normal spray programme permitted serious infection. Diphenylamine used as a dip or in wraps gave better control of scald on Granny Smith than oiled wraps.

Although *Verticillium* wilt of tobacco spreads very slowly it is becoming an increasingly important problem.

Crop research projects are outlined as before by E. J. Godley (pp. 43–45), and the plans of the Plant Diseases Division are summarized by G. H. Cunningham (pp. 64–65).

Annual Report of the Department of Agriculture, Jamaica, for the year ended 31st December, 1955.—74 pp., 6 pl., 1956. [Received Aug. 1957.]

On p. 26 of this report [cf. **35**, p. 749] it is stated that sodium succinate (manoxol OT) as a wetter improved the effectiveness of perenox and copper carbonate against leaf spot of banana (*Mycosphaerella musicola*) but not that of Bordeaux mixture, which was, however, improved by triton X-114 [cf. **37**, p. 48].

There was increased incidence of 'frond drop' [**35**, p. 366] on coconut palms. Some of the symptoms resembled those of drought wilt and false wilt, but frond drop can develop under conditions of adequate rainfall and drainage. Bud rot (*Phytophthora palmivora*) [cf. **33**, p. 590] occurred on dwarf coconut palms in Portland.

Georghiou (G. P.) & Papodopoulos (C.). **A second list of Cyprus fungi.**—*Tech. Bull. Dep. Agric. Cyprus* 5, 38 pp., 1957. [Mimeographed.]

This bulletin [cf. **18**, p. 550] contains 49 new records and 41 new host records for Cyprus made during 1954–57, bringing the total number of fungi recorded there to 420. The list includes *Fusarium oxysporum* on broad bean, *Ascochyta rabiei* on *Cicer arietinum*, *Puccinia antirrhini* [map 40] on antirrhinum, *Pyrenophora tritici-repentis* on wheat, *Sclerotinia fructigena* [map 22] on apricot, and *Spilocaea eriobotryae* on loquat. *Phytophthora infestans* has recently occurred with greater regularity on potato, causing serious loss to the spring crop in coastal areas [**36**, p. 381] on occasion since 1951.

Heath (R. G.). **Annual Report of the Department of Agriculture, Malaya, for the year 1955.**—x+100 pp., 5 fig., 1956.

In this report [cf. **35**, p. 278] it is noted (p. 32) that from tests of fungicidal dressings for rice seed, chiefly with organic mercurials, some tentative conclusions could be drawn: seed dressing brought about a general 10% increase in germination, but overdosage easily caused damage; treatment before or after soaking was equivalent; dusts were preferable to liquids; the treatment of old seed of reduced viability can give worthwhile results, but is of little or no advantage with good fresh seed. Amongst a number of fungi on rice seed *Trichoconis padwickii* [cf. **35**, p. 228] was isolated from each of 6 samples of grain from different localities, and *Helminthosporum oryzae* [*Cochliobolus miyabeanus*], the chief pathogen of germinating seed, from 5.

In a disease of young oil palms (p. 37) small leaf spots coalesced to form large dead areas, and in heavy attacks seedlings were killed. Two fungi, species of *Gloeosporium* and *Curvularia*, were isolated, and the latter was shown to be pathogenic. Oil palm bunches attacked by *Marasmius palmivorus* [**29**, p. 11; cf. **34**, p. 720] were also received, the unripe bunches being extensively invaded. Many palms on one estate were affected by a leaf base wilt, probably of physiological origin, in which the older leaf stalks bend over near the base at an acute angle.

The cause of fruit collapse (fruit rot or ghost fruit) of pineapple (pp. 41–42), a serious disease observed so far only in Johore, has proved to be a species of *Erwinia*. The var. Singapore Spanish is very susceptible and also apparently Selangor Green and Mauritius, but Sarawak has proved to be highly resistant. The causal organism is also responsible for heart rot [**36**, p. 771]. A basal rot affecting about 2% of pineapple slips during the hardening-off period before planting was caused by a species of *Thielaviopsis*.

Leaf spots and rim blight are common on cacao leaves (p. 51); *Phyllosticta theobromae* and *Physalospora theobromae* occur on the diseased areas, but deficiency of Ca or K is probably the cause. The first definite recent occurrence of pink disease (*Corticium salmonicolor*) [map 122] on cacao was recorded from Trengganu.

In tests of 5 fungicides against late blight (*Phytophthora infestans*) of tomato in the Cameron Highlands (p. 53) attack was heavy in all treatments, but Bordeaux mixture gave the best fruit yield.

Die-back of cloves (*Cryptosporella eugeniae*) (p. 53) was further observed on cloves in Selangor, Johore, and Malacca, suggesting that the pathogen is not a recent arrival in Malaya. *Valsa eugeniae* has not been reported outside Penang.

New disease records (p. 62) [**35**, p. 879] included storage rot of sweet potato (*Ceratocystis* sp.), leaf spots of *Tabernaemontana coronaria* (*Cercospora tabernaemontaneae*) and *Cassia fistula* (*Cercospora angustata*) [cf. **33**, p. 635], and a storage rot of gladiolus corms (*Fusarium* sp.).

Plakidas (A. G.). **New or unusual plant diseases in Louisiana.**—*Plant Dis. Reptr*, **41**, 7, pp. 643–644, 2 fig., 1957.

Two new records for Louisiana identified at the Louisiana State University, Baton Rouge, are stem rot (*Sclerotina sclerotiorum*) of tomatoes and *Entomosporium* leaf spot (*E. maculatum*) [*Fabraea maculata*] on *Photinia glabra*, the latter also apparently a new host record.

Bell (F. H.) & Alandia (S.). **Diseases of temperate climate crops in Bolivia.**—*Plant Dis. Reptr*, **41**, 7, pp. 646–649, 1957.

Included in this account of plant diseases in Bolivia [cf. **30**, p. 194] the following may be noted: *Septoria tritici*, *S. nodorum*, and *Puccinia graminis* on wheat and the last-named also on oats; *Rhynchosporium secalis* on barley; *P. sorghi* [map 279] and *Ustilago maydis* [map 93] on maize; *P. purpurea* [map 212] on sorghum; *Peronospora trifoliorum* [cf. **25**, p. 579] and *Uromyces striatus* on lucerne; *Albugo tragopogonis* and *Puccinia helianthi* [map 195] on sunflower; *Alternaria longipes* [map 63] on tobacco; *Melampsora lini* [map 68] on flax. Most of the diseases of tomatoes are virus infections, including tomato spotted wilt virus [map 8]. Curly top virus [map 24] and *Uromyces betae* [map 265] are found on beet; *Ascochyta pisi* [map 273] on peas; *Sclerotium cepivorum* [map 331] and *Peronospora destructor* [map 76] on onions; *Phytophthora capsici* [map 277] on [chilli] pepper; *Erysiphe cichoracearum* on cucurbits. The most destructive disease of peach is *Sphaerotheca pannosa*, followed by *Coryneum* [*Clasterosporium*] *carpophilum*, *Agrobacterium tumefaciens*, and *Monilinia* [*Sclerotinia*] *fructicola* [map 50]. *Plasmopara viticola* [map 221] occurs on vine and *Mycosphaerella fragariae* [map 110] was found on strawberry.

CICCARONE (A.). **Appunti sull'istruzione superiore e sulla sperimentazione agraria in Cina, con particolare riguardo alla patologia vegetale.** [Notes on higher education and experimentation in agriculture in China, with special reference to plant pathology.]—*Riv. Agric. subtrop.*, **51**, 4–6, pp. 145–166, 8 fig., 1957.

Notes, based on a visit to China in Aug.–Sept. 1956, are given on university agricultural education, agricultural experimental work, and the Academia Sinica, an advisory organization co-ordinating scientific societies. Since 1953 China has been a member of the International Organization for Plant Protection, and a Plant Protection Service has been instituted for propaganda, the organization of disease control, and quarantine, but production of fungicides and spraying machinery is still backward. Steps are being taken to establish a network of 'short-term' disease-forecasting stations, especially against *Phytophthora infestans* on potato [**37**, p. 53], and eventually it is hoped to initiate local weather forecasting for all the principal diseases.

The quarantine section was established at the end of 1955, and the Ministry of Agriculture is preparing a list of the chief plant diseases in China [cf. **35**, p. 636]. These are divided into two main groups: (1) diseases that can be successfully controlled at the outset, mainly by seed or planting-material treatment, e.g. the sweet potato disease caused by *Ophiostoma fimbriatum* [*Ceratocystis fimbriata*: **37**, p. 54], which is spreading rapidly in northern China; (2) diseases of known economic importance but whose etiology and control still require study, such as rice blast (*Piricularia oryzae*), bacterial leaf spot of rice (*Xanthomonas oryzae*) [cf. **31**, p. 458], red leaf virus of *Setaria italica*, and cereal rusts, the most important of which seems to be *Puccinia glumarum* [cf. **25**, p. 208]. The most serious diseases of industrial crops in general are tracheomycoses (such as fusariosis of sweet potato [? *Fusarium bulbigenum* var. *batatas*]), verticilliosis of cotton [*Verticillium* spp.: cf. **25**, p. 341], '*Peronospora*' disease of potatoes [? *Phytophthora infestans*: cf. **24**, p. 31], and, in the south, potato degeneration due to a complex of viruses. Jute is widely affected by *Colletotrichum corchorum* [**27**, p. 380], and vines by *Elsinoe ampelina* [map 234]. Economically, persimmons and *Zizyphus* spp. are very important for sweetening winter food in northern China; the former is affected by a serious disease attributed to *Cercospora kaki* [cf. **35**, p. 623], the latter by witches' brooms, probably of virus origin.

JACOBS (M. B.), GERSTEIN (M. J.), & WALTER (W. G.). **Dictionary of Microbiology.**—[iv]+276 pp., Princetown, N.J., Van Nostrand Co., Inc., 1957. $6.75.

The more than 5,000 entries in this work cover many of the terms commonly used in the fields of bacteriology, virology, serology, cytology, biochemistry, microscopy, and mycology. Applied mycologists will find this dictionary useful, particularly for information outside their own speciality.

GREEN (H. L.) & LANE (W. R.). **Particulate clouds: dusts, smokes, and mists.**—xix+425 pp., 8 pl., 107 fig., London, E. & F. N. Spon, 1957. 70*s*.

As stated in the preface 'many different types of cloud have essentially the same properties'; hence the relevance of this work to those interested in fungicidal dusts and sprays and in air-borne fungus spores. The first half of the book is devoted to basic principles and techniques, the second to applications to industry and the environment.

GILBERT (F. A.) & ROBINSON (R. F.). **Food from fungi.**—*Econ. Bot.*, **11**, 2, pp. 126–145, 1957. [60 refs.]

In this review of the potential and actual uses of fungi as human food the topics discussed include: utilization of waste products, value of fungi as food, history of

mushroom culture, future status of fleshy fungi as food, production of fungal mycelium as food, and economics of commercial food use of fungi.

Deighton (F. C.). **Vernacular botanical vocabulary for Sierra Leone.**—176 pp., London, Crown Agents, 1957. 13*s*. 6*d*.

This interesting work [cf. **36**, p. 7] consists of a general botanical index of plants in Sierra Leone with the various vernacular names which the author has collected, followed by botanical vocabularies in 15 local dialects. A number of generalized vernacular names of types of fungi and some of edible fungi are included.

Horton-Smith (C.)(Edit.). **Biological aspects of the transmission of disease.**—179 pp., Edinburgh & London, Oliver & Boyd, 1957. 21*s*.

In a symposium on biological aspects of the transmission of disease, organized in London by the Institute of Biology [in Sept. 1955], papers of phytopathological interest included: 'The dispersal of bacterial plant pathogens' (pp. 7–12) by J. E. Crosse, in which it is concluded that owing to the limited methods of dispersal and survival apart from the host, bacteria are not as successful as fungi as plant pathogens; a discussion of 'The soil as a reservoir of pathogenic micro-organisms' and of root-infecting fungi in particular by S. D. Garrett (pp. 13–18); and 'The fungal diseases of plankton algae', chiefly caused by chytrids and simple biflagellate phycomycetes, by J. W. G. Lund (pp. 19–23). P. K. C. Austwick (pp. 73–79) reviewed the role of insects in the spread of fungal disease; Mary Noble (pp. 81–85) the transmission of plant pathogens by seed; and F. C. Bawden (pp. 87–93) the transmission of plant viruses by insects. The dissemination of plant diseases and pests in international plant trade was discussed by W. C. Moore (pp. 135–139).

Resplandy (Renée). **Les maladies parasitaires des principales cultures tropicales. Revue bibliographique. XIX.** [The parasitic diseases of the principal tropical crops. A bibliographical review. XIX.]—*Rev. Mycol., Paris*, **22**, *Suppl. colon.* 1, pp. 19–42, 1957. [164 refs.]

Further notes in this series [**36**, p. 542] are based on world literature published mainly during 1954–56.

Waggoner (P. E.). **Weather and plant diseases.**—*Proc. Canad. phytopath. Soc.*, **24**, pp. 15–17, 1956.

The author enlarges upon the application of his modification of Gregory's mathematical model for the deposition of air-borne spores under various weather conditions [cf. **32**, p. 97; **36**, p. 357].

Gregory (P. H.) & Hirst (J. M.). **The summer air-spora at Rothamsted in 1952.**—*J. gen. Microbiol.*, **17**, 1, pp. 135–152, 2 diag., 1 map, 1957. [27 refs.]

The air over an arable field at Rothamsted Experimental Station was sampled from 1 June to 25 Oct. 1952 at 2 m. above the ground with an automatic volumetric spore trap [cf. **35**, pp. 152, 499; **36**, p. 605, *et passim*]. *Cladosporium* conidia accounted for 46% of the total catch; hyaline basidiospores (chiefly *Sporobolomyces*) for 31%; and pollen 1%. The results, which should be representative of large rural areas of central and southern England, show that the major changes of spore concentration depend on the weather and on the phenology of the local vegetation and its associated fungi. During 24 days in late June–July comparable estimates were made with another trap 24 m. above the ground. The spore concentration of the 12 commonest groups was 82% of that at 2 m.

Fungal spores appear to be present outdoors in greater numbers than bacteria. The most significant additions to our knowledge of the air-spora by the present work are the important autumnal contribution from basidiomycetes and the great

abundance of *Sporobolomyces*. Most ascospores were unclassified; this may disguise their importance, especially in wet weather. Some groups of organisms were present almost continuously throughout the period studied, with only slight changes in concentration; these included *Botrytis*, helicospores, and hyaline rods. Other fungi displaying peaks included *Erysiphe*, *Ustilago*, and *Phytophthora infestans*. *Ganoderma applanatum* provided higher maximum and total catches than *P. infestans* over a longer period and in a greater variety of weather. No evidence was obtained that soil micro-organisms constitute a significant proportion of the air-spora [cf. **33**, p. 41].

White (N. H.). **Host-pathogen relations in plants.**—*J. Aust. Inst. agric. Sci.*, **23**, 2, pp. 129–137, 1 graph, 1957. [26 refs.]

The author discusses with examples the relationships between pathogens in general and their plant hosts under the headings: non-reactive plants, plants which do not react in any way to the presence of the pathogenic inoculum; reactive plants, all of which are susceptible to some degree of infection, but only respond when the pathogen is present; necrogenic host reactions induced by necrotrophs (pathogens which must first kill the host tissue in order to colonize it) and biotrophs (pathogens only able to develop in living cells); histogenic host reactions, either sealing off the invading pathogen or forming histoid or organoid galls permitting its full development. The concluding section points out, *inter alia*, that hypersensitivity is associated with both necrotrophs and biotrophs, and appears to be universal, and that in establishing sources of host resistance sensitivity should be used as a basis.

Dowson (W. J.). **Plant diseases due to bacteria.**—xv+232 pp., 12 pl. (30 fig.), 21 maps, Cambridge, The University Press, 1957. 32*s*. 6*d*.

This book, reset under a new name and from a different publisher, is the second edition of the author's much-used 'Manual of bacterial plant diseases', 1949 [**29**, p. 252]. The figures have been reselected and reduced from 40 to 30, 3 more C.M.I. Distribution Maps have been reproduced, and the text has been enlarged and revised, but the main plan of the work is unchanged.

In place of the invalid generic name *Bacterium* the author adopts, for the time being, *Erwinia* and *Pectobacterium*, classifies the soft rot organisms as *P. carotovorum*, and proposes the new combination *E. tumefaciens* (Smith & Towns.) Dowson to replace *Agrobacterium tumefaciens*. Other new combinations have apparently been made, but a number of the new combinations and new species indicated were proposed in the first edition or elsewhere.

Adjanahoun (E.). **Étude cytologique et genèse des galles bactériennes des Rubiacées africaines du genre Psychotria.** [Cytological study and origin of the bacterial galls of African Rubiaceae of the genus *Psychotria*.]—*C.R. Acad. Sci., Paris*, **245**, 5, pp. 576–578, 1957.

A description is given of the bright green galls produced in *Psychotria calva* and other *P.* spp. in West Africa by a species of *Flavobacterium*. They are situated in the leaf parenchyma, more or less full of lacunae, surrounding the vascular bundle and are visible only on the lower leaf surface. They appear on some species in the form of bands or stripes along the mid-vein, while in others they are dispersed between the veins and look like scattered circular or irregular spots. The mature galls consist of a mass of tissue thickened by hyperplasia of the parenchyma, completely separated from the mesophyll by two or three layers of septate cells with a full complement of chlorophyll.

The yellow, more or less curved, rod-shaped, Gram+, non-acid-resistant bacteria, $0{\cdot}7$–$3{\cdot}5 \times 0{\cdot}2\ \mu$, immersed in an abundant mucilage, occupy the intercellular spaces in their entirety. The cells of the host contain numerous chloroplasts and their vacuoles are very rich in tannoids. The organisms are seed-borne and exist in every

bud. Their presence in the leaf rudiments is associated with great mitotic activity, which persists in the young, unfolding leaves and gives rise to hyperplasia of the parenchyma. Once the leaf is fully expanded its mitotic activity ceases, whereas that of the galls continues and is accompanied by a vast accumulation of chloroplasts in the cells. A mature gall is eliminated only with the fall of the parasitized leaf, but it frequently opens at an earlier stage by a longitudinal fissure, disclosing characteristic cellular malformations.

The bacterium was isolated in pure culture and induced typical galls on inoculation into the parenchyma of healthy leaves.

Braun (A. C.). **The activation of two growth-substance systems accompanying the conversion of normal to tumor cells in crown gall.**—*Cancer Res.*, **16**, 1, pp. 53–56, 1 pl., 1956.

In a further study at the Rockefeller Institute for Medical Research, New York, the author compares normal tobacco pith cells and those with crown gall (*Agrobacterium tumefaciens*) [**35**, p. 593]. Two growth-substance synthesizing systems normally subject to a very rigid control are activated, as a result of which the transition from normal cell to tumour cell is accomplished.

Rubio Huertos (M.) & Desjardins (P. R.). **Microscopia electrónica de las formas 'L' y filtrables del 'Agrobacterium tumefaciens'.** [Electron-microscopic study of 'L' and filterable forms of *Agrobacterium tumefaciens.*]—*Microbiol. esp.*, **9**, 4, pp. 375–382, 6 fig., 1956. [Received July 1957.]

Laboratory experiments at the Instituto de Edafología y Fisiología Vegetal, Madrid, in 1956, on 'L' forms of *Agrobacterium tumefaciens* induced by glycine in 1% solution, confirmed the presence of a membrane which, on occasion, liberated filterable forms by opening on one of its sides. It is considered that the presence of filterable forms may explain the occurrence of secondary tumours.

Manigault (P.) & Salmon (Janine). **Microradiographie des tissus de la plante au cours de la phase de conditionnement dans l'initiation d'une tumeur expérimentale.** [Micro-radiography of plant tissues during the conditioning phase of the initiation of an experimental tumour.]—*J. Rech.*, **37**, pp. 319–327, 7 pl., 1956. [Received Oct. 1957.]

Wounding of the stem of plants of *Pelargonium*, *Kalanchoe*, *Datura*, and *Bryophyllum* spp. with a needle to give (*a*) a sterile wound, (*b*) a wound infected by a non-tumour-forming organism, and (*c*) a wound infected by the tumour-forming strain 5–6 of *Agrobacterium tumefaciens* [cf. **35**, p. 817] was demonstrated by X-ray photography to cause in the primary or conditioning phase disturbances indispensable to the subsequent formation of a tumour, though not yet requiring bacterial intervention. The healthy cells bordering the wound develop a temporary predisposition [to tumour formation], creating in the intercellular spaces a new biochemical climate which later (during the induction phase) has an important effect on the pathogen. An analogous effect is exerted by the cells of the connective tissues during the growth of the tumour by apposition.

A radio-opaque tumoral zone was observed, the development of which depended partly on the traumatism caused by the wound and partly on infection. The appearance of the substance responsible for this opacity followed preliminary signs of activity in the intercellular spaces some distance away from the wound; this occurred in the host tissues during the first days after the experimental infection. It did not occur spontaneously.

Frear (D. E. H.). **Pesticide handbook.**—216 pp., Pennsylvania State College, College Science Publishers, 1957. $ 1.50.

The ninth annual revised edition of this handbook [**35**, p. 911] contains the

names of 6,234 commercial pesticides with their ingredients, uses, and manufacturers; it incorporates the same features as the previous edition.

British standard recommended common names for pesticides. B.S. 1831.—32 pp., London, British Standards Institution, 1957. 7*s*. 6*d*.

This revised list includes the following fungicides: captan [**31**, p. 562], dichlone, ferbam, maneb, nabam, thiram, zineb, and ziram.

Daines (R. H.). **Foliage fungicides and combination sprays.**—*Agric. Chemic.*, **12**, 4, pp. 32–34, 107–111, 1957.

The author sums up in popular terms the advantages of using fungicide mixtures, the possible effects of supposedly inert fillers and solvents on fungicides, and the promise offered by antibiotics.

1956 fungicide tests.—*Agric. Chemic.*, **12**, 2, pp. 51–57; 3, pp. 69–73; 4, pp. 62–66; 5, pp. 47, 111–112; 6, pp. 52–55, 117; 7, pp. 46–47, 99; 8, pp. 49, 99, 1957.

This report follows the same lines as its forerunners [**36**, p. 481].

Kenaga (C. B.) & Kiesling (R. L.) **Control of three foliar diseases by several fungicides in greenhouse tests.**—*Plant Dis. Reptr*, **41**, 4, pp. 303–307, 1957.

In a study at Michigan State University on the control of *Phoma lingam*, *Colletotrichum lindemuthianum*, and *Puccinia sorghi* on cabbage, bean [*Phaseolus vulgaris*], and maize, respectively, actidione, panogen 15, hexachlorobenzene, and the omadine salts of copper, zinc, manganese, and sodium were applied as foliar sprays, most of which gave good control. The best results were obtained with sodium and copper omadine and panogen 15, which with the other omadine salts were more effective than actidione and hexachlorobenzene. Panogen 15 controlled infection by *C. lindemuthianum* at higher temperatures more effectively than the other fungicides.

Miller (P. M.) & Linn (M. B.). **Viability of Cabbage, Carrot, Sweet Corn and Lima Bean seed treated with thiram or copper oxinate and stored at three different temperatures.**—*Plant Dis. Reptr*, **41**, 4, pp. 308–311, 1957.

At the Connecticut Agricultural Experiment Station, New Haven, and the University of Illinois, Urbana, seed of cabbage, carrot, sweet corn, and lima bean [*Phaseolus lunatus*] treated with thiram or bioquin 1 and stored for 4, 8, or 12 months at 2°, 14°, or 32° C. generally showed no viability loss directly attributable to the fungicides. Treated seed usually germinated better than untreated. Untreated cabbage seed lost more viability when stored at 2° than at 32° and vice versa for lima bean seed. It is concluded that the effect of storage temperature varies with different seed and that seed treatment helps to maintain viability in sub-optimum storage conditions.

van den Ende (G.) & Verhoeff (K.). **De invloed van koperverbindingen op de ontwikkeling van enkele schimmels in vitro.** [The influence of copper compounds on the development of some fungi *in vitro*.] —*Tijdschr. PlZiekt.*, **63**, 4, pp. 200–208, 4 fig., 2 graphs, 1957. [German summary.]

Certain wood-destroying fungi are known to precipitate copper fungicides in the form of copper oxalate [**18**, p. 426]. At the Phytopathologisch Laboratorium 'Willie Commelin Scholten', Baarn, the authors studied 11 fungi with respect to acid production, ability to precipitate copper, and tolerance of copper at various levels.

They concluded that the ability to eliminate copper in the form of complex or insoluble compounds is not restricted to fungi parasitizing wood, and that there

was no connexion between the level of acid production *in vitro* and tolerance of copper.

Somers (E.). **Studies of spray deposits. I.—Effect of spray supplements on the tenacity of a copper fungicide.** & Thomas (W. D. E.). **II.—The tenacity of copper fungicides on artificial and leaf surfaces.**—*J. Sci. Fd Agric.*, 7, 2, pp. 160–172; 10, pp. 655–667, 10 graphs, 1956.

Of the 47 materials tested at Long Ashton for their influence on the tenacity of cupric oxide on a cellulose acetate surface, the most promising stickers (agar, linseed oil, lime casein, polyvinyl acetate, coumarone resin, rubber latex, and polyvinyl chloride) were used as supplements to cupric oxide [**35**, p. 908] in a potato blight [*Phytophthora infestans*] field trial. Most of the supplements increased the tenacity of the cupric oxide, but none improved blight control.

In vitro experiments with *Alternaria tenuis* showed that of the 7 supplements polyvinyl chloride and polyvinyl acetate alone did not decrease the fungitoxicity of the cupric oxide. Polyvinyl chloride, at a sufficiently high concentration, is likely to prove a suitable sticker for copper fungicides.

Further studies on factors influencing the tenacity of spray deposits of cuprous and cupric oxides, copper carbonate and oxychloride, Bordeaux and Burgundy mixtures showed that tenacity values varied with the level but not with the type of distribution of the deposit. The tenacities increased, except in the case of Bordeaux, with decreasing initial deposit. This increase in tenacities of cupric oxide and copper oxychloride was correlated with decreasing particle size. The fungitoxicities of different size fractions of cupric oxide, determined against *A. tenuis*, failed to increase with decreasing particle sizes below 6 μ, indicating that a saturation value of the surface had been reached. The physico-chemical forces determining the tenacity of a spray deposit, in the absence of supplements, are briefly discussed. Field experiments showed rain to be the more important weathering agent, but the effect of wind was found to be considerable and seemed more prolonged.

Block (S. S.). **Reversal of fungitoxicity of copper-8-quinolinolate.**—*Agric. Fd Chem.*, **4**, 12, pp. 1042–1046, 1956.

At the University of Florida, Gainesville, the fungitoxicity of copper-8-quinolinolate was progressively reversed [**36**, p. 483] by increasing concentrations of Cu, Ni, and Fe ions, and with excess 8-quinolinol. The reversal with excess metals is ascribed to the suppression of the cell-penetrating 2:1 chelate and the reversal with excess 8-quinolinol to the suppression of the toxic 1:1 chelate inside the cell.

Marsh (P. B.). **An effect of salts in antidoting the inhibition of germination of spores of Stemphylium sp. by copper sulfate.**—*Plant Dis. Reptr*, **41**, 7, pp. 553–557, 2 graphs, 1957.

Studies by the Agricultural Research Service, Beltsville, Maryland, on the antidoting of the effect of copper on *Stemphylium* sp. [**24**, p. 238; **36**, p. 542] showed that with calcium chloride or magnesium sulphate a molarity of 60 to 75 times that of copper sulphate was required to provide strong antidoting as measured by spore germination, while with potassium and sodium chloride the ratio needed was about 3,000.

Coles (G. V.), Martin (J. T.), & Byrde (R. J. W.). **The fungistatic properties of coal tar constituents.**—*Rep. agric. hort. Res. Sta. Bristol, 1956*, pp. 101–102, [1957].

Further *in vitro* studies of the activity of coal-tar products against *Ceratostomella* [*Ceratocystis*] *fimbriata* are reported [**36**, p. 124].

Sporek (K. F.). **Determination of mercury in fungicidal preparations containing organo-mercury compounds.**—*Analyst*, **81**, 965, pp. 474–482, 1956.

In the first part of this paper directions are given for the direct titration of organo-mercury compounds with the organic radicle attached to the mercury atom, and in the second a technique for the determination of mercury in complex commercial preparations (including fungicides), based on decomposition to mercuric sulphide, is described.

Jones (D. R.). **The systemic action of sulphonamides against plant diseases.**—*Outlook on Agric.*, **1**, 3, pp. 111–115, 1 col. pl., 2 graphs, 1956. [20 refs.]

Following a review of the control of plant diseases by systemic treatment with sulphonamides, an account is given of experiments at Jealott's Hill Research Station of Imperial Chemical Industries Ltd., Bracknell, Berks. In a typical experiment rust (*Puccinia coronata*) infection of oats was controlled in pot cultures by replacing the nutrient solution by one containing sulphonamide [cf. **33**, p. 472]. Sulphanilamide reached high concentrations in the leaves and was more effective than the poorly-translocated sulphaguanidine.

The distribution of sulphonamides was studied in broad bean plants in a solution containing 100 μg./ml. During 10 days' continuous treatment under greenhouse conditions the uptake of sulphonamide in sulphaguanidine was a linear function of the water transpired, but with sulphanilamide and sulphadiazine the increase of sulphonamide in the tissues was a logarithmic function of the water transpired. Sulphaguanidine and sulphadiazine tended to accumulate in the roots, but sulphanilamide moved rapidly into the leaves and consequently was very effective in the control of *Uromyces fabae*. Sulphadiazine was less effective and sulphaguanidine useless. The action of sulphanilamide was fungistatic rather than fungicidal as rust infections developed on plants after treatment was stopped. A further disadvantage of these compounds is their phytotoxicity. The sulphonamides have only proved of use against obligate parasites. Their application commercially does not seem to be worth while at present.

Sijpesteijn (A. K.), Janssen (M. J.), & van der Kerk (G. J. M.). **Investigations on organic fungicides. XI. The role of metals and chelating agents in the fungitoxic action of sodium dimethyldithiocarbamate (NaDDC).**—*Biochim. Biophys. Acta*, **23**, pp. 550–557, 2 graphs, 1957.

In continuation of this series [**36**, p. 482] from the Institute for Organic Chemistry, Utrecht, Netherlands, with *Aspergillus niger* as the test organism in a liquid glucose mineral salts medium, sodium dimethyldithiocarbamate (NaDDC) is reported not to produce a first zone of inhibition. This zone is, however, induced by the addition of Cu or Co but not by Fe, Zn, or Mn. From spectrophotometric measurements and growth results it was found that the first zone of inhibition coincides with the presence of the 1:1 complex of copper and dithiocarbamate. At higher NaDDC concentrations the non-toxic 1:2 complex is formed and the zone of inversion growth emerges. In the presence of free dithiocarbamate the second zone of inhibition appears.

The toxicity of the 1:1 complex is attributed to combination with an essential enzyme, and the antagonism of imidazole derivatives is explained on the basis of their competing with the 1:1 complex for the essential enzyme.

A. niger is induced to accumulate pyruvic acid by free dithiocarbamate, and to a lesser extent by the 1:1 complex.

Kearns (H. G. H.) & Morgan (N. G.). **Spray application problems: XXXVII. A disc punch for sampling leaves for the assay of spray deposits.**—*Rep. agric. hort. Res. Sta. Bristol, 1956*, pp. 145–146, 1 pl., 1 diag., [1957]; **XXXVIII.**

A centrifugal spray pump. (With an 80 c.c. 2-stroke engine.)—*ibid.*, pp. 147–150, 2 pl.; **XXXIX. A general purpose lance for use with power spray machinery on tropical crops.**—*ibid.*, pp. 151–153, 1 pl.; **XL. A lightweight spray lance.**—*ibid.*, pp. 153–156, 1 diag.; **XLI. Modifications of the Long Ashton $\frac{1}{4}$" B.S.P. spray nozzle for special requirements.**—*ibid.*, pp. 157–162, 2 diag.

XXXVII. The sampler consists of a pair of spring-loaded pliers with a tapered bush on each jaw, into one of which is fitted a removable, hollow, metal punch and into the other an anvil containing a push-fitted rubber or polythene disk. The punches are readily sharpened and are available with areas of 1 or 0·5 sq. cm. The cost is about £1.

XXXVIII. The specification and performance data are given of a pump which is mounted directly on the shaft of the engine, both within a sturdy tubular chassis. The total weight is 45 lb. and the simple construction and maintenance are suitable for unskilled users.

XXXIX. The specification is given of a lance, designed for use by unskilled labour on tropical crops, which incorporates a large filter and a simple robust tap, and is lined with polyvinyl chloride to resist corrosion. All components requiring cleaning can be removed by hand without spanners.

XL. The specification is given of a lightweight lance, suitable for operation with knapsack and small power sprayers, and designed for operation with one hand. It comprises a brass or polyvinyl chloride tube, a quick-acting trigger tap, a filter unit, and a $\frac{1}{4}$ in. B.S.P. swirl or fan spray nozzle set at an angle. All components are threaded $\frac{1}{4}$ in. B.S.P.

XLI. The modifications described [cf. **30**, p. 236] include a long-range disk, a protected and easily cleaned ceramic holder, and a filter.

Atti del secondo Convegno sugli anticrittogamici acuprici, Torino, 17 novembre 1956. [Proceedings of the second Convention on non-copper fungicides, Turin, 17 November 1956.]—*Notiz. Malatt. Piante, 1957*, 40–41 (N.S. 19–20), pp. 1–211, 5 pl. (1 col.), 4 fig., 1 diag., 12 graphs, 1957.

This Convention [cf. **36**, p. 537] was held to discuss the results obtained with non-copper fungicides in Italy in 1956, and the material provided falls into four sections covering, respectively, the chemistry of these products (pp. 11–33), their practical efficacy (pp. 35–145), their side-effects on plants (pp. 147–168), and the final motion passed (p. 169). The whole concludes with six notes dealing with biometry in relation to control of plant diseases.

R. Ciferri and A. Corte (pp. 11–16) [English summary] described the effect of zineb on parsley plants experimentally inoculated with *Septoria petroselini*; in the first 4 days the daily increase in diameter of the spots was 0·5–0·66 mm. on the untreated controls and 0·0–0·1 mm. on the zineb-treated plants. F. Bertossi (pp. 17–21) dealt with the chlorophyll content of vine leaves treated with Bordeaux mixture and zineb, his work showing that by the time leaf fall became rapid the chlorophyll content had so much declined that the time during which the leaves remained attached to the plants no longer had any importance in relation to assimilation. R. Ciferri (pp. 22–27) [English summary] spoke on the possible protective action of zineb against the effect of smog from factory fumes [cf. **36**, p. 48] in causing silver-leaf effects on market-garden and other herbaceous plants. Lettuces growing near Pavia (in the vicinity of factories using chemicals) and thickly dusted with zineb against *Marssonina panattoniana* and celery plants in the same area similarly treated against *Septoria apiicola* [*S. apii*] remained fully protected against the fumes, though plants treated with copper oxychloride or calcium oxychloride received much less protection. The zineb also gave full control of both fungi. R. Ciferri (pp. 28–33) [English summary] described preliminary comparative tests in the laboratory of the duration of the fungicidal effect of Bordeaux mixture

(1:1:100) and zineb (0·3%) against *Monilia* [*Sclerotinia*] *fructigena*. The results showed that the fungicidal effect was the same for both materials during the first 4 days. The LT_{50} was 10 days and the LT_{25} 17–18 days for Bordeaux, while the corresponding figures for zineb were 8–11 and 13–14. After an artificial rain (2 mm. in 2 hr.), the fungicidal effect of Bordeaux was reduced to about one-half, and that of zineb to one-quarter; under these conditions weathering was almost complete from the fourth day. To improve the persistence of zineb a better sticker is required.

G. Borzini (pp. 35–37) describes tests carried out in Piedmont in 1956 against vine downy mildew [*Plasmopara viticola*] which confirmed the equal efficacy of zineb and Bordeaux. The addition to the zineb of wind-blown or wettable sulphur had no effect on fungicidal efficiency, but colloidal sulphur slightly increased it. The fungicidal efficiency of zineb was increased by the addition of karathane. E. Mazzoni (p. 42) reports excellent curative effects of SR406 at 0·25% against *Taphrina deformans* on peach. V. Bonu (pp. 43–44) reports tests in which a new fungicide, bonu (containing a quaternary ammonium salt, biurate, and 6% Cu), used at 1% gave more rapid results against vine downy mildew than either zineb or captan and better results against *Oidium* [*Uncinula necator*]. According to C. Sibilia (p. 47), zineb was as effective as Bordeaux against vine diseases [unspecified]. Captan was slightly phytotoxic and caused more defoliation than zineb. Karathane had a better curative effect against *U. necator* than sulphur, and was also good as a preventive.

I. Cosmo (pp. 48–49) states that trials in the vicinity of Venice again demonstrated that fungicides containing zineb (especially aspor) or captan (especially orthocide) were superior to 1% Bordeaux against *P. viticola*. The protective action of the non-copper materials persisted for about 2 weeks. Karathane (1%) was almost equal to sulphur dusts and wettable sulphur in its control of *U. necator*.

In trials by C. Giorgi (pp. 56–58) in the vicinity of Pavia in 1954, zineb (as aspor 0·2%) gave better control of *P. viticola* than did 1% Bordeaux. Its chief defects were its lack of effect against *U. necator*, its limited persistence, and the yellowing and premature shedding of the leaves that it caused. In 1954–5, vines were again treated with zineb and also given 4 applications of sulphur, with resultant excellent control of *U. necator*. In 1955–6, this programme was repeated, 8 applications being made, and there was no attack of either disease.

E. N. Maseroli (pp. 60–61) reports that growers in the province of Parma were more than satisfied with the control of *P. viticola* by zineb (aspor), the treated vines having an average yield of 4·414 kg., as against 3·185 kg. for Bordeaux treatment. V. Tullio (pp. 62–66) states that in 1956 zineb (aspor) gave satisfactory control of *P. viticola* in tests in the provinces of Modena and Reggia Emilia. *U. necator* was effectively controlled by 3 or 4 applications of wind-blown sulphur. G. Miotto (pp. 67–68) recommends the use of zineb against vine downy mildew at the beginning of and during flowering. G. Miotto (pp. 69–71) states that in the province of Padua materials containing zineb, used at 0·2%, were more effective against *P. viticola* than Bordeaux. D. Picco (pp. 72–73) records trials in the Po valley in which karathane at 50 g./100 l. water gave excellent control of *U. necator*. According to D. Rui (p. 78) the use of non-copper-containing materials against scab [of apple and pear: *Venturia inaequalis* and *V. pirina*] in the province of Venice is still spreading. On the other hand, products containing zineb allowed intense infection of peaches by *T. deformans* to develop, though this did not happen when ziram was used.

G. Miotto (pp. 82–89) reports trials conducted in the province of Padua in 1955–6 in which zineb (tiezene) displayed high toxicity towards *T. deformans*. Bordeaux was also effective against the parasite at a concentration of 2% $CuSO_4$. The efficacy of tiezene at 0·9% was equal to that of Bordeaux containing 2 or 3% $CuSO_4$.

At 0·6% tiezene did not confer total protection from *T. deformans* upon susceptible varieties in seasons favourable to infection. A single treatment in autumn (Nov.) was very effective, while one application in March gave even better results, but this appeared to be due to seasonal conditions. Combined treatment against *T. deformans* and *Cladosporium* [*Fusicladium*] *carpophilum* should have taken the form of a treatment in autumn and one at the end of Jan. A third treatment may be given in spring, the double programme, therefore, including a treatment with Bordeaux containing 2% $CuSO_4$ in autumn, zineb 0·9% in winter, and zineb 0·2% in spring.

In work by G. Govi at Bologna (pp. 90–93) applications were made to Star Delicious apple trees of Bordeaux 0·8%; captan (SR406) 0·4%; zineb (tiezene) 0·2%; Bayer mercury compound 0·2%; thiram (pomarsol forte) 0·2%; thiram+ziram (tuzet) at 0·125%; ziram (pomarsol Z forte) 0·2% up to the end of May (3 applications), then thiram+ziram (tizet) 0·125%; a compound of sulphur and captan (SM55) at 0·5%; a compound containing thiram (fernide) at 0·2%; and karathane at 0·1%, to 3 Aug. (making 8 applications in all). At harvest, sulphur and captan gave 98% apples free from scab [*V. inaequalis*]; Bordeaux, fernide, ziram, and ziram+thiram 97%; captan, the mercury compound, zineb, and ziram +thiram 96%; pomarsol forte 94%; karathane 40%; and the untreated, 0.

G. Miotto (pp. 94–117) gives a full account of 3 years' trials near Padua on the control of apple scab. By comparison with the usual fungicides, tiezene was found to be ideal, displaying great activity against the fungus with a complete lack of phytotoxicity.

M. Cristinzio (pp. 118–119) reports that near Portici, Naples, the control of *Sclerotinia laxa* on apricots given by zineb was quite as good as that given by copper-containing products; captan and nirit were less effective. M. Cristinzio (p. 119) also states that a mixture of zineb and copper controlled *Phytophthora infestans* on potato and tomato at Portici as well as Bordeaux did and against *Alternaria solani* and *Stemphylium solani* on potato was even more effective. Zineb also gave good results against *Septoria lycopersici* [on tomato].

Antonella Romano (pp. 132–136) [English summary] describes experiments at the University of Catania, Sicily, in which griseofulvin at between 0·3 and 60 μg./ml. caused curling, stunting, and growth malformation of the hyphae of *Deuterophoma tracheiphila*. At 40 μg./ml. effective fungistatic action resulted. Concentrations of 0·3 and 0·6 μg./ml. led to the production by *D. tracheiphila* of short, stunted germ-tubes, which ceased to develop at an early stage.

In pot tests by R. Ciferri (pp. 141–144) [English summary] at Pavia, good control of *Fusarium* yellows (*F. orthoceras* [*F. oxysporum*] f. *gladioli*) and corm spongy rot (*Botrytis gladiolorum*) of gladioli [cf. **35**, p. 186], using artificially wounded corms in soil with heavy natural infestation, was given by soil fumigation with vapam at 240–480 kg./ha.

F. Baresi (p. 145) states that at San Remo zineb has almost completely taken the place of copper compounds for the control of carnation rust (*Uromyces caryophyllinus*) [*U. dianthi*: cf. **34**, p. 649]. It also gives moderate control of *Heterosporium echinulatum* [*Didymellina dianthi*: cf. **34**, p. 432] and *Alternaria dianthi* [cf. **32**, pp. 80, 561] on the same host, and of *Phragmidium subcorticium* [*P. mucronatum*: cf. **33**, p. 437] and *Peronospora sparsa* [cf. **23**, p. 90; **33**, pp. 27, 70] on rose.

According to M. L. Bestagno Biga (p. 145), the spread of fatal wilt of *Euphorbia hermentiana* caused by *Coniothyrium concentricum* f. *gattefossei* near Pavia was arrested by spraying every 10 days with 0·3% zineb.

Hamor (G. G.). **A note on fungicides: 2-trichloromethanesulfenyl-6-nitrosaccharin and related compounds.**—*J. Amer. pharm. Ass.*, Sci. Ed., **46**, 3, pp. 207–208, 1957.

At the University of Southern California, Los Angeles, the above-mentioned com-

pound was synthesized and tested for its effects on *Stemphylium sarciniforme* and *Sclerotinia fructicola*. It totally inhibited spore germination in both organisms at 1 µg./ml. and was therefore somewhat more active than 2-methylsaccharin (*J. Amer. chem. Soc.*, **61**, p. 15, 1939) and much more so than N-methylphthalimide (*J. Amer. pharm. Ass.*, Sci. Ed., **43**, p. 120, 1954).

Hislop (E. C.). **Some observations on the effects of fungicides on enzyme systems in Botrytis cinerea.**—*Rep. agric. hort. Res. Sta. Bristol, 1956*, pp. 116–120, [1957].

B. cinerea was cultured in a liquid mineral medium in the presence of each of 4 fungicides (copper sulphate, lime-sulphur, captan, and *o*-phenyl phenol) at concentrations found by preliminary experiment to cause 20–80% inhibition of growth (over 5 days at 25° C.), and the mycelial mats were examined for content of catalase, peroxidase, cytochrome *c* oxidase, and alkaline phosphatase [cf. **36**, p. 110].

Copper sulphate depressed catalase, increased cytochrome *c* oxidase, and had little effect on alkaline phosphatase: at 0·05% it stimulated peroxidase threefold, but at 0·1% there was a depression to one-twentieth of the control level. Lime-sulphur depressed all 4 enzymes. Captan increased catalase and cytochrome *c* oxidase, depressed peroxidase, and was without effect on alkaline phosphatase. *o*-Phenyl phenol decreased catalase and peroxidase, and stimulated cytochrome *c* oxidase and alkaline phosphatase.

Cortesi (R.) & Fleury (C.). **Effet fongistatique de l'anhydro-mercuri-3-nitro-5-crésol-2. II. Sur le Botrytis cinerea (Pers.).** [Fungistatic effect of anhydro-mercury-3-nitro-5-cresol-2. II. On *Botrytis cinerea* (Pers.).]—*Bull. Soc. pharm. Bordeaux*, **96**, 1, pp. 15–19, 3 graphs, 1957.

At the Société de Pharmacie de Bordeaux the above-mentioned compound inhibited the growth of a strain of *B. cinerea* at concentrations of 1/1,250,000 and 1/600,000–1/500,000 on Raulin's and Rudloff's media, respectively.

Schuldt (P. H.) & Wolf (C. N.). **Fungitoxicity of substituted s-triazines.**—*Contr. Boyce-Thompson Inst.*, **18**, 9, pp. 377–393, 1956.

By replacing the 3 chlorine atoms of cyanuric chloride stepwise by arylamino, aryloxy, alkyloxy, and alkylamino groups the authors obtained mono-, di-, and tri-substituted symmetrical triazines, some 70 of which, together with 8 other reaction products, were examined for fungitoxicity as evidenced by ability to prevent (1) germination of spores of *Alternaria oleracea* [*A. brassicicola*] and *Monilinia* [*Sclerotinia*] *fructicola*, (2) infection of tomato foliage by *A. solani* and *Phytophthora infestans*, (3) pea seed decay caused by *Pythium* sp. and other soil fungi, and (4) deterioration of fabric by cellulolytic micro-organisms.

The substitution of a single arylamino or aryloxy group yielded highly toxic dichlorotriazines. Members of the di-substituted series were much less toxic, and those of the tri-substituted series were ineffective. Placement of a halogen or methyl group on the benzene ring of 2,4-dichloro-6-(anilino)-*s*-triazine produced several highly effective fungicides, the best of which, 2,4-dichloro-6-(*o*-chloroanilino)-*s*-triazine, is considered to show commercial promise, and has been coded as B-622.

Rhodes (A.), Crosse (R.), McWilliam (R.), Tootill (J. P. R.), & Dunn (A. T.). **Small-plot trials of griseofulvin as a fungicide.**—*Ann. appl. Biol.*, **45**, 1, pp. 215–226, 1957.

At Glaxo Laboratories, Ltd., Stoke Poges, Bucks., Trocadero summer lettuces sprayed 2 or 4 times with griseofulvin [**36**, p. 715] at 0·022, 0·044, and 0·088% developed significantly less (natural) infection by *Botrytis cinerea* than the

untreated. The concentration and number of applications appeared to make no difference to the degree of control.

In 1955, Darwin tulips (William Copeland) were treated on 4 occasions from 31 Mar. to 26 Apr. with 1·75% griseofulvin dust at 120 lb./acre or with sprays containing 0·044 and 0·088% griseofulvin at 90–120 gal./acre, and inoculated with a suspension of *B. tulipae* 3 days after the final application. All the treatments reduced infection.

In 1956, a commercial crop of early tulips (mixed varieties), forced under movable Dutch lights and previously having received 2 ferbam sprays, was given 7 applications of 0·1% griseofulvin during the growing period at 75, 88, 83, 75, 62, 25, and 25 gal./1,000 sq. yd., respectively, or 7 of ferbam, each at 37½ gal. Control of *B. tulipae* (natural infection) was much better in the griseofulvin than in the ferbam treated beds. The antibiotic caused no injury to the plants.

In 1955, 5 applications of a 0·044% griseofulvin foliage spray gave marked control of natural infection by mildew (*Oidium chrysanthemi*) in a commercial crop of pot-grown chrysanthemums. In 1956, a number of griseofulvin formulations and methods of application were compared with karathane for mildew control on susceptible pot-grown Aztec chrysanthemums. Watering the roots with 0·1% griseofulvin gave much the best results. As foliage sprays, griseofulvin at 0·05 and 0·025% and karathane (0·05%) did not differ significantly. The addition of griseofulvin to a dimethylformamide formulation gave greater control than the latter alone, though griseofulvin and a wettable powder together were not significantly more effective than the powder alone.

That little advantage resulted from increasing the concentration of the griseofulvin in foliage sprays suggests that its action is limited by degree of penetration, and the root-watering experiments indicate that it may be most effective as a systemic fungicide. Griseofulvin is likely to be most valuable, from an economic point of view, against *Botrytis* diseases of crops subject also to damaging attacks by mildews.

HARTZFELD (F. G.). **Terraclor, a new soil fungicide.**—*Agric. Chemic.*, **21**, 7, pp. 31–33, 1957.

Terraclor [**36**, p. 647] (active ingredient pentachloronitrobenzene) is available as dust, wettable powder, and emulsifiable formulations. It is stated to be particularly effective against fungi which form sclerotia, and remains active in the soil for as long as 12 months after application. Field tests have shown it to be effective against *Rhizoctonia*, *Sclerotinia*, *Sclerotium*, *Streptomyces*, *Plasmodiophora*, *Botrytis*, and *Tilletia caries*, the first mentioned being controlled at very low concentrations. *Fusarium*, *Pythium*, *Verticillium*, *Phytophthora*, *Thielaviopsis*, and *Aphanomyces* are not effectively controlled. Terraclor is now registered for use with clovers and lucerne, cotton, vegetables, groundnuts, wheat, and ornamentals. It is most frequently used as a soil mix, and with crops like cotton and beans it is sprayed or dusted over the seed and surrounding soil during planting.

MARTIN (J. T.). **Spray application problems : XXXII. Note on the determination of surface deposits of copper fungicides.** -*Rep. agric. hort. Res. Sta. Bristol, 1956*, pp. 125–126, [1957].

A modification of the method of assessing copper deposits on leaf disks [**35**, p. 908] is described. Quicker and more reliable results are obtained when a borate buffer is used (*Chem. & Ind.*, p. 395, 1957).

VANWETSWINKEL (G.). **De rugnevelspuit. Het apparaat voor de kleine bedrijven.** [The knapsack mist sprayer. The apparatus for small concerns.]—*Cult. en Hand.*, **23**, 5, pp. 129–130, 2 fig., 1957.

This is an explanation in simple terms of the principles and applications of the

knapsack mist sprayer, the popularity of which is stated to have increased immensely of recent years in small-scale agricultural and horticultural concerns in the Netherlands. It is estimated that 3–5 ha. of low-growing crops, such as beet, cereals, or strawberries, and 1·5–2 ha. of low-stocked fruit trees can be treated in a day, using 10 times less liquid than with an ordinary spraying machine (200–300 instead of 2,000–3,000 l./ha.). It is, however, necessary at the same time to increase the concentration of the fungicide tenfold, e.g. from 1 to 10 kg./l.

Ball (S.), Bessell (Christine J.), & Mortimer (Aileen). **The production of polyenic antibiotics by soil Streptomycetes.**—*J. gen. Microbiol.*, **17**, 1, pp. 96–103, 1957. [21 refs.]

Studies at Glaxo Laboratories, Ltd., Stoke Poges, Bucks., are described on 60 *Streptomyces* isolates (from 25 soil samples from different parts of the world) producing polyene antibiotics which showed antifungal activity.

Akai (S.), Shishiyama (J.), & Egawa (H.). **On the antifungal antibiotics discovered in Japan. I.**—*Forsch. PflKr.*, **6**, 1, pp. 37–46, 1956. [Received 1957. 55 refs.]

The following antifungal antibiotics, isolated from actinomycetes in Japan, are described: actinon, cacaomycetin, candimycin, chromin, eumycetin, fermicidin, flavacin, leucomycin, microcin A and B, moldin, mycelin, phaeofacin, rotaventin, seligocidin, trichomycin, toyacamycin, vinacetin, virosin, W-2 substance, and X-1 substance.

Lion (O. I.). Наблюдение над влиянием некоторых микробов-антагонистов и их анти-биотических веществ на возбудителей заболеваний растений. [An observation on the effect of some microbial antagonists and their antibiotic properties on causal agents of plant diseases.]—*Acta phytopath. sinica*, **1**, 1, pp. 95–100, 3 fig., 1955. [Chinese. Abs. from Russian summary. Received 1957.]

A number of actinomycetes isolated from soil in Chinese rice fields were antagonistic to *Rhizopus nigricans* [*R. stolonifer*], *Macrophoma sesami* [*Macrophomina phaseoli*], *Glomerella gossypii*, *Fusarium* sp., and *Xanthomonas malvacearum* and prevented the development of green mould [*Penicillium digitatum*] on mandarin orange.

Smith (G.). **Anti-fungal tests on quadrilineatin.**—*Biochem. J.*, **67**, 1, pp. 163–164, 1957.

This report from the Dept of Biochemistry, London School of Hygiene and Tropical Medicine, is an appendix to a contribution (pp. 155–163) by J. H. Birkinshaw, P. Chaplen, and R. Lahoz-Olivier entitled 'Quadrilineatin (1:2-diformyl-5-hydroxy-3-methoxy-4-methylbenzene), a metabolic product of *Aspergillus quadrilineatus* Thom & Raper'.

Tested against *Botrytis allii* [cf. **32**, p. 140] and *Pythium debaryanum*, quadrilineatin completely inhibited conidial germination in the former and mycelial growth in the latter species at a dilution of 1/25,000 (40 μg./ml.).

Müller (J.). **Spezifischer Nachweis von SO_2-Rauchschäden an Pflanzen mit Hilfe von Blattpigmentanalysen.** [Specific demonstration of SO_2-smoke injuries to plants with the aid of leaf pigment analyses.]—*Naturwissenschaften*, **44**, 16, p. 453, 1957.

At the Forstbotanisches Institut, Munich, Germany, chlorophyll *a* was more rapidly disorganized than chlorophyll *b* in *Abies alba* and spruce needles, the former experimentally and the latter naturally damaged by SO_2 fumes [cf. **35**, p. 856, *et passim*]. This phenomenon has not been observed in the disorganization of the green pigments of plants damaged by drought and frost, and appears specific for SO_2. The application of pigment analysis to the diagnosis of smoke injury is consequently recommended, full details of the method being given.

Nicolson (T. H.). **Mycorrhiza in grasses and cereals.**—*Rep. Sch. Agric. Nottingham, 1956*, pp. 33–38, 1 pl., 1957.

In illustration of the phenomenon of mycorrhiza in grasses brief mention is made of a study of sand fescue (*Festuca rubra* var. *arenaria*) and marram grass (*Ammophila arenaria*) colonizing sand dunes at Gibraltar Point, Lincolnshire. Stages of the invasion of the root cortex by mycorrhizal fungi, with the formation of vesicles and intracellular arbuscules, are illustrated.

Heim (A. H.), Silver (W. S.), & Birk (Y.). **Cytochrome composition of some strains of Streptomyces.**—*Nature, Lond.*, **180**, 4586, pp. 608–609, 1957.

The cytochromes present in 14 strains of *Streptomyces* were compared spectrophotometrically at the Institute of Microbiology, Rutgers University, New Brunswick, and found to be similar to those in other micro-organisms.

Kluepfel (D.). **Über die Biosynthese und die Umwandlungen der Fusarinsäure in Tomatenpflanzen.** [On the biosynthesis and transformations of fusaric acid in Tomato plants.]—*Phytopath. Z.*, **29**, 4, pp. 349–379, 3 fig., 1957. [English summary. 63 refs.]

Stoll (C.) & Renz (J.). **Über den Fusarin- und Dehydrofusarinsäurestoffwechsel von Gibberella fujikuroi (Saw.) Woll.** [On the fusaric and dehydrofusaric acid metabolism of *Gibberella fujikuroi* (Saw.) Woll.]—*ibid.*, pp. 380–387, 2 graphs, 1957.

Stoll (C.), Renz (J.), & Gäumann (E.). **Über die Bildung von Fusarinsäure und Dehydrofusarinsäure durch das Fusarium lycopersici Sacc. in saprophytischer Kultur.** [On the formation of fusaric acid and dehydrofusaric acid by *Fusarium lycopersici* Sacc. in saprophytic culture.]—*ibid.*, pp. 388–394, 6 graphs, 1957.

In the first of these studies [cf. **36**, p. 791] from the Eidgenössischen Technischen Hochschule, Zürich, it was shown that when tomato cuttings are given a known dose of radio-active labelled fusaric acid, 83·5% of the radio-activity is extractable with 80% ethanol after 48 hr. The corresponding figures for the other solvents tested, i.e. absolute, 50, and 10% ethanol, twice-distilled water, absolute and 80% methanol, ether, and chloroform, were 80, 79, 81, 81, 80, 80, 79, and 83, respectively. The compound is largely metabolized, 10%, for instance, being decarboxylated and occurring as $^{14}CO_2$. Basic and neutral ether-insoluble substances were also present, while unchanged fusaric acid constituted a considerable proportion of the residue. The basic extract contained a substance identified with the aid of the chlorine salt as N-methyl-fusaric acid amide, which in the plant may be saturated with organic acids. It proved to be non-toxic to plant organisms. This is believed to be the first record of a nitrogen methylation acting as a detoxication mechanism in plants.

No qualitative differences were detected in the metabolic products of the test varieties of tomato, Bonny Best, Tuckswood, and Red Currant, but with increasing resistance to *F.* [*bulbigenum* var.] *lycopersici* more detoxicated substances are evolved (the proportion being over 3 times as high in the last-named as in the 2 others), while the amount of fusaric acid decreases. The toxin could not be demonstrated in the mycelium of the fungus and was therefore presumed to be secreted extracellularly. It was, in fact, detected in infected Bonny Best and Tuckswood plants, but Red Currant gave negative results.

In the second study cultures of *G. fujikuroi*, isolated from rice in Japan on Richards's solution, were tested biologically and chemically 3 times a week for the production of fusaric and dehydrofusaric acids [cf. **34**, p. 251]. Using the *Ustilago* [*maydis*] spore germination test [**34**, p. 472], two clear-cut activity maxima were observed to occur during the growth phase of *G. fujikuroi*, one on the 21st and the

second on the 28th day. Chemical tests showed that the latter coincided with the maximum output of fusaric acid (about 350 mg./l.). It decreased until the 33rd day and then remained on the same level. Not until the 21st day could dehydrofusaric acid be detected in the culture filtrates; it gradually increased until the 43rd and was thereafter secreted in the same proportions as fusaric acid until the close of the experiment after 2 months. The assay of the culture solutions for dehydrogenase activity yielded negative results.

The acid toxins could not be demonstrated in any of the mycelial extracts.

The site of the isolated double linkage in dehydrofusaric acid could be established by ozone decomposition.

In the third study the writers observed two sharply defined activity maxima, on the 24th and 34th days, during the growth of *F. b.* var. *lycopersici* on Richards's solution with 5% glucose over a 2-month period. The quantity of fusaric acid increased up to the 24th day and thereafter remained at a more or less constant level until the close of the experiment. Dehydrofusaric acid was isolated for the first time from the tomato wilt fungus, its production beginning only when that of fusaric acid reached a peak on the 24th day. The toxins could not be isolated from the mycelium.

Venkata Ram (C. S.). **Studies on cellulolytic activity of Fusaria with reference to bacterial and other cellulose substrates.**—*Proc. nat. Inst. Sci. India*, Ser. B, **22**, 4, pp. 204–211, 1 pl., 3 graphs, 1957.

In a study of 23 species of *Fusarium* [**28**, p. 585] at the University Botany Laboratory, Madras, bacterial cellulose but not filter paper was attacked by *F. buharicum*, *F. chlamydosporum*, *F. poae*, and *F. sporotrichioides*. All the other test species decomposed both substrates, with the exception of *F. caucasicum*, which attacked neither. The cellulose activity of the culture filtrates was directly related to the ability of the species to attack filter paper, and was generally at a maximum at pH 5·5.

Grimes (R. M.), Duncan (C. W.), & Hoppert (C. A.). **Multiplicity of cellulolytic enzymes of Myrothecium verrucaria.**—*Arch. Biochem.*, **68**, pp. 412–424, 2 diag., 2 graphs, 1957.

The results are presented of a study at the Departments of Agricultural Chemistry and Chemistry, Michigan State University, East Lansing, of the action of various culture filtrate fractions of *M. verrucaria* [cf. **36**, pp. 47, 114, *et passim*] on cellulose sodium sulphate and an insoluble cellulose.

Waid (J. S.) & Parkinson (D.). **Soil microbiology.**—*Nature, Lond.*, **180**, 4586, pp. 591–592, 1957.

In a symposium on techniques for soil microbiology at the University Institute of Agronomy, Louvain, Belgium, 3–5 June 1957, methods of sampling soil fungi were discussed by P. Simonart and O. Verona. J. S. Waid and M. J. Woodman described the estimation of hyphal activity by burying nylon gauze for several months and then counting the number of hyphae per mesh. New techniques outlined by D. Parkinson have demonstrated the existence of well-defined microfloras in different parts of the rhizosphere at various stages of plant development. Using a method with an efficiency of 97% for extracting nematodes from soil, J. S. Waid, C. K. Capstick, and D. C. Twinn showed that 45% of the samples were infested by either saprophytic or predacious fungi.

Mirchink (T. G.). О грибах, обусловливающих токсичность дерново-подзолистой почвы различной степени о культурнности. [On fungi causing

toxicity of podsolized soil of various cultivation grades.]—Микробиология [*Microbiology*], **26**, 1, pp. 78–86, 2 fig., 1957. [English summary.]

Maximum toxicity of podsolized soil in the Moscow area to germinating seed (mainly wheat) was observed where no fertilizer, or only mineral nitrogen, was added. Liming and manuring reduced toxicity and decreased the numbers of toxic fungi in the soil. Of the fungi isolated from the soil, *Penicillium cyclopium* proved the most toxic to germinating wheat seeds.

FEDORINCHIK (N. S.) & VANDERFLAAS (L. K.). Влияние антагонистической активности почвенного гриба **Trichoderma lignorum Harz** на повышение урожая сельскохозяйственных культур. [Effect of the antagonistic activity of the soil fungus *Trichoderma lignorum* Harz on increase in yields of agricultural crops.]—*Trud. vsesoyuz. Inst. Zashch. Rast.*, **5**, pp. 17–37, 6 fig., 1954.

In a series of pot and field experiments in the U.S.S.R. the introduction of *T. lignorum* [*T. viride*: **36**, p. 681] into sterilized soil inhibited the growth of a number of fungus pathogens including *Fusarium lini* and *Colletotrichum* [*linicola*] on flax, *Helminthosporium*, *Alternaria*, and *Fusarium* spp. on wheat, *Sclerotinia* sp. on sunflower, and *Phytophthora* [? *infestans*] and *Rhizoctonia* [*Corticium solani*] on potato. Most of the plants growing in non-sterilized soil containing *T. viride* developed vigorously, with increased yields.

DOBBS (C. G.), HINSON (W. H.), & BYWATER (JOAN). **Mycostasis in soils.**—Abs. in *J. gen. Microbiol.*, **17**, 1, p. xi, 1957.

Inhibition of germination of spores of *Penicillium frequentans* in close contact with moist surface soils [cf. **32**, p. 643] was removed in work at the University College of North Wales, Bangor, by the addition of glucose to the soil above a widely varying threshold quantity, by heat, desiccation, or any other treatment releasing nutrient by killing soil organisms, by organic solvents, and by mixing the soil with charcoal. Inhibition returned when the glucose was attenuated by the soil organisms and when the solvent had evaporated. Seitz-filtered water extracts of soils reduced germination, but the effect diminished with storage.

Work with *Mucor ramannianus* showed that percentage germination on an open cellulose film can be used to determine intensity of the effect in some soils. Others give complete inhibition unless glucose is added, though 2 forest humus samples stimulated the growth and sporulation of moulds when incubated.

AGNIHOTHRUDU (V.). **Occurrence of Dictyosteliaceae in the rhizosphere of plants in Southern India.**—*Experientia*, **12**, 4, p. 149, 1956. [German summary.]

In further investigations at the University Botany Laboratory, Madras [cf. **35**, p. 232], 6 species of Dictyosteliaceae were isolated from cultivated and 4 from uncultivated soils, their incidence being highest in the rhizosphere soil of both types. *Dictyostelium mucoroides* was the species most commonly recorded.

WESTERDIJK (JOHANNA). **De stichtingen: het Centraalbureau voor Schimmelcultures en het Phytopathologisch Laboratorium 'Willie Commelin Scholten'.** [The foundations: the Central Bureau for Fungus Cultures and the Willie Commelin Scholten Phytopathological Laboratory.]—*Tijdschr. PlZiekt.*, **63**, 4, pp. 169–170, 1957.

A short note on the history of the C.B.S. [cf. **35**, p. 87].

PHILLIPS (D. H.). **Plant diseases in Jersey, 1951 to 1955. 1. Diseases of the Tomato and the Potato.**—*Rep. States Jersey, 1955*, pp. 43–51, 1957.

This annotated list is based on the advisory records.

Sandu-Ville (C.) & Radulescu (I.). **Contribution à la connaissance des micromycètes de Moldavie. (3e note.)** [A contribution to the knowledge of Moldavian micromycetes. (3rd note.)]—*Rev. Biol.*, **1**, 2, pp. 91–104, 1956.

This list, based on the material collected in various parts of the province during 1946–50, includes 259 microfungi. About a third of these collections are stated to be new records for Romania.

Munk (A.). **Danish pyrenomycetes. A preliminary flora.**—*Dansk. bot. Ark.*, **17**, 1, 491 pp., 202 fig., 1957. 100 kr.

As the result of a critical revision of Danish herbarium material the author presents keys to, and descriptions of, all the known Danish species of Pyrenomycetes.

Yu (T.-F.). **A preliminary list of Fusaria in China.**—*Acta phytopath. sinica*, **1**, 1, pp. 1–18, 1955. [Chinese. Abs. from English summary. Received 1957.]

Included among the 1,000 *Fusarium* isolates obtained during the past 25 years from various crops in China were the 44 spp. and 35 vars. here listed with their hosts. Methods of classification are briefly discussed [cf. **36**, p. 731].

Holm (L.). **Études taxonomiques sur les Pléosporacées.** [Taxonomic studies on the Pleosporaceae.]—*Symb. bot. upsaliens.*, **14**, 3, 188 pp., 1 pl., 6 fig., 1957. [221 refs.] Kr 20.

After an introductory section covering material, technique, habitat, terminology, and nomenclature, the author describes, with keys, 35 species of *Leptosphaeria*, 12 of *Melanomma* (with an additional 6 doubtful spp. and an appendix containing 4 of uncertain systemic position), 2 of *Ophiobolus* (including the new *O. anthrisci* Holm), 18 of *Nodulosphaeria*, *Leptospora nubella*, 17 of *Phaeosphaeria*, 6 of *Entodesmium*, 7 of *Trichometasphaeria*, 2 of *Massarina*, 2 of *Didymosphaeria*, and 10 of *Trematosphaeria*. In conclusion, consideration is given to the genus *Scleropleella*, with a description of *S. personata*.

Leptosphaeria coniothyrium is transferred to *Melanomma*, *L. eustoma* and *Ophiobolus herpotrichus* to *Phaeosphaeria*, and *L. circinans* to *Trematosphaeria*.

Arx (J. A. von). **Die Arten der Gattung Colletotrichum Cda.** [The species of the genus *Colletotrichum* Cda.]—*Phytopath. Z.*, **29**, 4, pp. 413–468, 10 fig., 1957. [English summary. 149 refs.]

Following a brief introduction and explanation of the problems involved, this important study opens with a discussion of the literature on the nomenclature of *Colletotrichum*, *Vermicularia*, *Gloeosporium*, and *Glomerella*. In agreement with Duke [**8**, p. 268], the author proposes the conservation of *C.* on practical grounds, notwithstanding the priority of *V.* as the older name. *Gloeosporium* is a heterogeneous genus, the type species, *G. castagnei*, with its bicellular conidia belonging to *Marssonina*, while various species that have been assigned to *C.*, e.g. *C. gloeosporioides*, develop an ascigerous state and are referable to *Glomerella* (*G. cingulata*) [see below].

Broader concepts underlie the basis of *C.*, as herein understood, than those employed in the establishment of previous diagnoses. Thus, it may contain species with either glabrous or setose acervuli. Typical of all, however, is the formation of appressoria on a germ-tube of varying length. A list of synonyms and a description of the genus are followed by a key to the species.

The designation *C. gloeosporioides* is selected from about 600 names to indicate the conidial state of *G. cingulata*. The morphology and development of the acervuli and perithecia are described. The variability of the species is attributed to the easy and regular occurrence of mutations [cf. **6**, pp. 57, 322; **29**, p. 218, *et passim*]. It is pathogenic to numerous plants, causing fruit rot, wilting, leaf spots, necroses,

and anthracnoses, and may also be harboured in a symptomless form. The fungus has also been shown by inoculation experiments to be transmissible from one plant species to another. Some well-known examples of specialized infection are cited.

Species of *C.* with cylindrical or elliptical conidia like those of *C. gloeosporioides* are *C. lini* [*C. linicola*], parasitic on flax; *C. destructivum* (clover, lucerne, soy-bean, *Vicia*, and *Melilotus* spp. [**35**, p. 20], and other plants, e.g. *Bromus inermis* [**35**, p. 193]); *C. fuscum* on *Digitalis lanata* and other *D.* spp. [**36**, p. 575]; *C. fusarioides* on *Asclepias* spp., known only in North America (*Mycologia*, **16**. p. 169, 1924); *C. phyllachoroides* on *Artemisia* spp. and *C. paludosum* on *Peltandra virginia*, also in North America; *C. atramentarium* on potato [**36**, p. 784] and (mostly as a saprophyte) on *Solanum*, *Dahlia*, *Brassica*, *Cucurbita*, and *Clematis* spp.; and *C. crassipes*, isolated from *Oncidium excavatum* (old, dying leaves), *Sansevieria zeylanica*, *Agave* sp. (leaf spots), and rotting tomato fruits, which is characterized by large conidia ($22–31 \times 6–8\,\mu$) and sinuate appressoria, $8–12\,\mu$ diam.

C. graminicola, here as the imperfect state of *G. tucumanensis* [**34**, p. 108], and *C. dematium* are characterized by falcate or lunate conidia. The latter species, of which some 80 synonyms are listed, occurs mostly as a saprophyte on numerous plants, but certain forms are parasitic, e.g. *C. d.* f. *spinaciae* (Ellis & Halst.) von Arx (*C. spinaceae*) on spinach [**34**, p. 663] and *C. d.* f. *circinans* (Berk.) von Arx (*C. circinans*) on onion [**35**, p. 264].

Arx (J. A. von). **Revision der zu Gloeosporium gestellten Pilze.** [Revision of the fungi placed in the genus *Gloeosporium*.]—*Verh. Akad. Wet. Amst.*, Ser. 2, **51**, 3, 153 pp., 40 fig., 1957.

In this revision of the heterogeneous genus *Gloeosporium*, 735 species are listed alphabetically and all except 92 are discussed and redisposed; 288 species previously included in *Gloeosporium* are considered to be the conidial state of *Glomerella cingulata*. Two new genera, *Melanophora* (Melanconiales) and *Rhynchosporina* (Hyphomycetes), are described and 125 new combinations proposed. The agent of banana anthracnose is renamed *Colletotrichum musae* (Berk. & Curt.) von Arx (syn. *Gloeosporium musae* Berk. & Curt., *G. musarum* Cke & Mass.) [see below].

Arx (J. A. von). **Kultur- und Infektionsversuche mit einigen Colletotrichum-Arten.** [Culture and infection experiments with some *Colletotrichum* species.]—*Tijdschr. PlZiekt.*, **63**, 4, pp. 171–190, 2 pl., 2 fig., 1 diag., 1957.

At the Phytopathologisch Laboratorium 'Willie Commelin Scholten', Baarn, 50 strains of *C.* from widely different sources were found to be divisible among three species, *C. crassipes*, *C. lini* [*C. linicola*], and *C. gloeosporioides* (*Glomerella cingulata*) [see above], based on the shape and size of the conidia. Within the last-mentioned, however, differences in growth would permit the differentiation of *C. lindemuthianum* (attacking *Phaseolus vulgaris*), *C. trifolii* (other legumes), *C. orbiculare* (Cucurbitaceae), and *C. musae* (banana fruits). *Colletotrichum* and *Gloeosporium* could not be distinguished in culture. The 7 aforementioned *C.* species were then examined for infectivity for *Phaseolus vulgaris* and fruits of apple, orange, and tomato.

It was difficult to distinguish species by morphology in culture, and it was concluded that species set up on this basis require splitting into many biotypes. Within a morphological species some strains are restricted to one host while others may infect a number of unrelated hosts. Re-isolation may then yield new biotypes and occasionally new morphological forms, probably because of the heterogeneity of the original inoculum, even where this came from a single spore. The variability of such strains shows itself in the tendency to sector formation in culture. *C. lindemuthianum*, *C. orbiculare*, and *C. trifolii* were not clearly distinguishable, either morphologically or biologically, from *C. gloeosporioides*, and the first two

are suggested as forms of this species. *C. musae* should be merged with *Glomerella cingulata*, as both produce identical symptoms on the banana and are difficult to distinguish in culture.

DOGUET (G.). **Morphologie et organogénie du Neocosmospora vasinfecta E. F. Smith et du Neocosmospora africana von Arx.** [The morphology and organogenesis of *Neocosmospora vasinfecta* E. F. Smith and *Neocosmospora africana* von Arx.]—*Ann. Sci. nat., Bot.*, Sér. 11, **17**, 25, pp. 353–370, 4 fig., 1956. [17 refs.]

A study of the development of the perithecia of *N. vasinfecta* and *N. africana* showed that at first no archicarp is differentiated. A vegetative hypha develops several filaments, which branch and become entangled together, forming a nodule, the cells of which are at first identical. An ascogonium rapidly forms in the nodule, and the perithecium develops as a function of this new element. Underneath, and laterally, the wall forms a thick, plectenchymatous cushion with broad, vacuolized cells. Above, a cavity tends to appear, but is soon filled with pseudoparaphyses. The ascogonium provides a hymenium, from which the asci arise, growing inversely among the pseudoparaphyses. The ostiole results from the development of the periphyses in the internal layer of the wall, which elsewhere becomes a plectenchymatous cushion. The periphyses finally pierce the outer protective layer.

Although the perithecial development of *N.* does not entirely resemble that of *Nectria*, it is so similar to that of *Thyronectria* and *Sphaerostilbe* that it seems only logical to place *Neocosmospora* also among the Hypocreales. The genus is also very close to *Pseudonectria*, differing from it only in spore colour. *P. ornata* (*An. Soc. Biol. Pernambuco*, **13**, pp. 72–86, 1955) has hyaline ascospores, the wall of which possesses an undulating external surface which resembles that present in *N. vasinfecta*. The organogenesis of *N.* also has many points in common with that of the ascosporous fructifications of *Pleospora* species.

PANZER (J. D.), TULLIS (E. C.), & VAN ARSDEL (E. P.). **A simple 24-hour slide spore collector.**—*Phytopathology*, **47**, 8, pp. 512–514, 1 fig., 3 graphs, 1957.

This is a more detailed description from Fort Detrick Biological Laboratories, Frederick, Maryland, of a spore collector, already noticed from an abstract [**36**, p. 775]. Each hourly sample covers 1 sq. in., the air intake being 4·8 l./min. The cost was approximately $60.00, without the battery.

FUNDER (S.) & JOHANNESSEN (SYNNØVE). **The membrane filter as an aid in the cultivation and identification of fungi.**—*J. gen. Microbiol.*, **17**, 1, pp. 117–119, 1 pl., 1957.

A method of cultivating fungi on a membrane filter, devised at the University of Oslo, Norway, is described. A sterile, absorbent pad was placed in a sterile Petri dish and evenly moistened with 2 ml. of sterile double-strength yeast water. A sterile membrane filter was placed on top and inoculated. The dish then being incubated at room temperature for 2–3 days, the entire filter, or a piece of it, was removed, dried at 50° C. for 20–30 min., and placed in immersion oil on a slide, thus rendering the membrane transparent and suitable for microscopic examination by transmitted light. Growth on the membrane is allowed to continue as long as is desired, and each time inspection of the culture becomes necessary, a small piece of the disk is removed.

BAWDEN (F. C.). **Research on viruses and virus diseases.**—*J.R. agric. Soc.*, **117**, pp. 75–83, 1956.

This is a popular, general account of viruses, virus diseases, and their control.

Broadbent (L.). **Insecticidal control of the spread of plant viruses.**—*Ann. Rev. Ent.*, **2**, pp. 339–354, 1957. [73 refs.]

The control of plant virus diseases by applying insecticides to destroy the vectors [**36**, p. 169] is reviewed from the standpoints of early experiments, experiments with contact persistent insecticides and with systemic insecticides, experimental procedure, and finally, future prospects.

Hansen (H. P.). **Correlations and interrelationships in viruses and in organisms. II. The principles of the natural periodical system of plant and animal infecting viruses.**—*K. VetHøjsk. Aarsskr., 1957*, pp. 31–66, 1957.

This continuation of the author's consideration [cf. **36**, p. 374] of virus classification includes a discussion of tabulations ('periodic systems') based on some analogies between plant- and vertebrate-infecting viruses.

Săvulescu (A.) & Pop (I.). **Contribuţii la studiul stolburului în Romînia.** [Contribution to the study of stolbur in Romania.]—*Bul. şti. Acad. Repub. rom.*, **8**, 4, pp. 723–737, 6 fig., 1956. [Russian and French summaries.]

Tomato stolbur virus [**36**, p. 680] causes considerable damage in Romania. The symptoms on potato, tomato, eggplant, *Capsicum annuum*, and *Convolvulus arvensis* are described. Symptoms appeared on tomato 40 days after grafting with infected tomato, potato, eggplant, or *C. annuum*, and on Bonny Best tomato and Priska potato (60–100% diseased plants) 20–30 days after transmission by *Hyalesthes obsoletus*. Stolbur virus was shown to be one of the causes of spindle sprout in potatoes, though not transmitted by the tubers. In summer-planted potatoes infection diminishes but does not disappear.

Grover (R. K.). **Mutation in viruses.**—*Bull. bot. Soc. Univ. Saugar* 7, pp. 35–40, 1955. [33 refs.]

The author discusses the general process of mutation in viruses [**28**, p. 270] and concludes that the term 'mutation' is justly used to indicate the changes, sudden and permanent, observed in a particular strain of a virus.

Gray (R. A.). **Combating plant virus disease with a new antiviral agent, cytovirin.**—*Plant Dis. Reptr*, **41**, 7, pp. 576–578, 1957.

In the Merck Sharp & Dohme Research Laboratories, Rahway, New Jersey, a complete prevention of local lesion formation by bean mosaic virus and tobacco mosaic virus has been achieved by spray levels of 0·5–1 p.p.m. of crystalline cytovirin, isolated from culture filtrates of an unidentified species of *Streptomyces*. Efficient protection from systemic infection by tomato spotted wilt virus and tobacco mosaic virus was observed when tomato and tobacco plants were sprayed twice (2 hr. after inoculation and 12 days later) with a solution containing 100 p.p.m. of crude cytovirin.

Broyles (J. W.). **Comparative studies of races and biotypes of Puccinia graminis, with special reference to morphology of uredospore germination, chemical composition, and factors affecting survival.**—*Diss. Abstr.*, **17**, 5, pp. 954–955, 1957.

At the University of Minnesota the author studied characters which may be used to differentiate taxa within *P. graminis*. There were inherent differences between *P. g. tritici* and *P. g. avenae* in respect of the length and tendency to branch of the uredospore germ tubes, and also in the number with anastomoses and apical swellings. Uredospores of *P. g. tritici*, *P. g. avenae*, and *P. coronata avenae* showed small but consistent qualitative differences in silver nitrate-reducing compounds, and qualitative and quantitative differences in free amino acids between races. Certain biotypes of *P. g. tritici* exhibited a fairly constant rate of increase on Little Club

wheat under a wide range of conditions, while others varied greatly as conditions changed.

No overall differences were found between biotypes in respect of percentage germination of uredospores collected over a 1-year period, though some [unspecified] biotypes were differentiated in this way on certain [unspecified] media. Comparison of the infectivity of 5 biotypes on 13 wheat varieties [cf. **35**, p. 664] showed differences among biotypes and varieties, and interaction between them.

The spore production curve of 4 biotypes resembled a sine curve with decreasing amplitude and wavelength, the fungus alternating between vegetative growth and sporulation (63% of spores produced in 1st productive period, 27% in 2nd, 8% in 3rd, and 2% in last). Changes of light intensity and, more particularly, temperature had differential effects on biotypes with respect to rate of increase and spore production. Rate of increase, germination, ability to infect, and spore production were seldom associated, indicating that the survival potentialities of biotypes depend upon the cumulative effects of these factors. Biotypes of the same race differed as greatly as biotypes of different races for most of the characters studied.

Machachek (J. E.). **Co-operative seed treatment trials. 1956.**—*Plant Dis. Reptr*, **41**, 4, pp. 317–323, 1957.

In this annual review the author presents results from the tests with 17 new seed dressings, mostly fungicide-insecticide combinations, effective against bunt (*Tilletia* spp.) of wheat and to a lesser degree against surface-borne smuts (*Ustilago* spp.) of oats and barley [cf. **35**, p. 765]. Control of [unspecified] flax seed rot was not good. Storage of the treated seeds for 4 months proved to be injurious to wheat, and in many cases to flax, but seldom to oats and barley (though panogen 15 proved toxic to the last-named).

Chu (V.), Tu (S.-M.), Nien (K.-L.), & Wang (L.). **Red arsenic powder as a seed disinfectant for the control of cereal smuts.**—*Acta phytopath. sinica*, **1**, 1, pp. 45–59, 1955. [Chinese. Abs. from English summary. Received 1957.]

At the East China Agricultural Research Institute, Nanking, red arsenic powder (90% As_2O_3, 9% As_2S_2) was found to be an effective seed disinfectant for cereals. It is easily obtained in China and it improves germination and increases grain yields. In plot experiments over a 4-year period, dusting inoculated seeds with red arsenic (0·05% by seed weight), copper carbonate (0·3), and ethyl mercury phosphate (0·05) reduced wheat bunt (*Tilletia* spp.) [**28**, p. 13] to 0·2, 1·4, and 2·7%, respectively, as against 44·8% for the untreated, the corresponding figures for wheat flag smut (*Urocystis tritici* [*U. agropyri*]) [loc. cit.] being 3·1, 0·8, 5, and 20·5; barley covered smut (*Ustilago hordei*) 0·9, 1·1, 0·9, and 1·6; and oat kernel smut (*U. laevis* [*U. kolleri*]) 6·8, 3·1, 0·5, and 41·4.

As a result of these studies, dusting thoroughly dried seeds with red arsenic at 0·05–0·0125% before a month's storage under cool (below 25° C.) and rather dry (80% R.H.) conditions is recommended for the control of cereal smuts.

Böning (K.). **Starkes Auftreten von Schwärze an Getreide.** [Extensive occurrence of blackening of cereals.]—*Pflanzenschutz*, **9**, 8, p. 115, 1957.

During the current season numerous reports were received of the remarkable prevalence of black mould (mostly *Cladosporium herbarum*) on cereals in Germany, where foot rot (*Ophiobolus graminis*) has been similarly widespread. An etiological connexion between the two diseases is postulated, one of the predetermining factors probably being the mild winter of 1956–7 and the other increasing negligence in the observance of a correct sequence in the rotation (general regression of the cultivation of oats and undue frequency of wheat and barley on comparatively unsuitable soils at the expense of rye). The colonization of the moulds also appears to have

been promoted by the honeydew which developed in the excessively hot and sultry weather at the beginning of July.

McKinney (H. H.), Paden (W. R.), & Koehler (B.). **Studies on chemical control and overseasoning of, and natural inoculation with, the soil-borne viruses of Wheat and Oats.**—*Plant Dis. Reptr.* **41**, 4, pp. 256–266, 1957.

In joint experiments by the U.S. Dept of Agriculture and the S. Carolina and Illinois Agricultural Experiment Stations at Beltsville, Clemson, and Urbana, respectively, on wheat mosaic virus [**35**, p. 439] and oat mosaic virus [**35**, p. 443] it has been found that formaldehyde, chloropicrin, CS_2, D–D, and ethyl alcohol easily rendered infected soils non-infectious; toluene was not effective. Although plants grown in autoclaved soil to which roots of naturally infected mosaic plants from the field had been added became diseased, this did not occur when the soil was inoculated with virus-infected sap or leaves, or with roots or leaves of plants infected mechanically. It is, therefore, considered that a vector, closely associated with the roots of mosaic diseased plants, is involved in the natural overseasoning and transmission of the soil-borne cereal viruses.

McKinney (H. H.). **Maintenance of naturally infectious cultures of the soil-borne viruses of Wheat mosaic, and of Oat mosaic, without the use of soil.**—*Plant Dis. Reptr*, **41**, 4, pp. 254–255, 1957.

Soil-borne wheat and oat mosaic viruses have been conveniently maintained by culturing roots of infected plants, washed free from soil, in various types of sand and grit with a nutrient water supply. To test for possible vectors likely organisms are introduced into sand cultures in which virus-free cereal plants, mechanically inoculated, are grown. The aerial parts are removed some 3 months later, and fresh cereal seed, already germinated, planted in the remaining root culture. If the organism tested is a vector, the subsequent plants will develop mosaic. Two nematodes (*Aphelenchus avenae* and *Panagrolaimus* sp.) so tested gave negative results.

Hacker (R. G.) & Vaughn (J. R.). **Chemically induced resistance to stem rust of Wheat by derivatives of acti-dione.**—*Plant Dis. Reptr*, **41**, 5, pp. 442–446, 1957.

At the University of Wyoming, Laramie, pre-infection resistance to black stem rust (*Puccinia graminis tritici*) [**35**, p. 5] in the spring wheat, Onas, was induced by the semicarbazone of cycloheximide, a new derivative of actidione. The resistance persisted for the life-time of the plant after spraying at the boot stage. Plots receiving 200 p.p.m. before inoculation remained rust-free, while the untreated developed 65% infection; treatment at 100 p.p.m. was nearly as effective. The acetate of cycloheximide had a similar effect but did not induce complete resistance. At effective concentrations neither material reduced yield or germination.

Watson (I. A.). **Mutation for increased pathogenicity in Puccinia graminis var. tritici.**—*Phytopathology*, **47**, 8, pp. 507–509, 1957.

Studies at the University of Minnesota, St. Paul, using material originating in single uredospore cultures of each of 4 races of *P. graminis* from wheat (XR-1 and 11, both orange; GB-1, grey-brown; 111, red), resulted in the production in the greenhouse of mutants varying in pathogenicity from the parent race. The inoculum was increased on Little Club, and then transferred to Lee [**36**, p. 179] and Bowie. Mutants XR-2 and 11-1 were obtained from XR-1 and 11, and GB-2 from GB-1, each more virulent on Lee than the parent, and distinguishable also on Gabo, Timstein, Gaza, and Kenya C6042, but indistinguishable on Bowie or on other wheat varieties tested.

BASILE (RITA). **A diagnostic key for the identification of physiologic races of Puccinia rubigo-vera tritici grouped according to a unified numeration scheme.**—*Plant Dis. Reptr*, **41**, 6, pp. 508–511, 1957.

A key is given for the identification of races of *P. rubigo-vera tritici* [*P. triticina*: **35**, p. 288; **36**, p. 579].

HASSEBRAUK (K.). **Die physiologische Spezialisierung des Weizenbraunrostes (Puccinia triticina Erikss.) in Deutschland im Jahre 1955.** [Physiological specialization of Wheat brown rust (*Puccinia triticina* Erikss.) in Germany in 1955.]—*NachrBl. dtsch. PflSchDienst* (*Braunschweig*), *Stuttgart*, **9**, 8, pp. 125–126, 1957.

Examination at the Institut für Physiologische Botanik, Brunswick, of 230 samples of wheat infected with *P. triticina*, sent in from 147 West German localities, revealed the presence of races 1, 17, 20, 52, and 93, and also the new race mentioned in 1954 [**36**, p. 311]. Race 17 had maintained its former dominance unchanged, while races 1 and 52 had shown slight and appreciable increases. It was possible, by use of an additional test variety, Sizilianischer Binkel, to demonstrate a new biotype of each race except the last.

FANG (C.-T.) & CHEN (N.-Y.). **Varietal resistance of Wheat to stripe rust at the seedling stage and the variability of the causal organism.**—*Acta phytopath. sinica*, **1**, 2, pp. 155–168, 1955. [Chinese. Abs. from English summary. Received 1957.]

At Nanking Agricultural College collections of stripe rust (*Puccinia glumarum*) [**25**, p. 208] from 48 localities in E. China were used in the seedling inoculation of 150 varieties and lines of wheat. None was resistant to all the isolates but some resisted one or more. In addition to these inoculations field tests in various localities are advisable.

HOLTON (C. S.). **Wheat smut control in the Pacific Northwest.**—*Agric. Chemic.*, **12**, 7, pp. 42–43, 95; 8, pp. 35–36, 97, 1957.

This review from the Agricultural Research Service, Regional Smut Research Laboratory, Pullman, Washington, traces the work which has led to the acceptance of hexachlorobenzene (HCB) as the seed treatment of choice against soil-borne and seed-borne bunt [*Tilletia caries* and *T. foetida*] and dwarf bunt [*T. controversa*] of wheat in the Pacific Northwest [cf. **35**, pp. 598, 599; **36**, p. 391, *et passim*].

PODHRADSZSKY (J.). **A Búza Törpeüszögje Magyarországon.** [Dwarf bunt of Wheat in Hungary.]—*Ann. Inst. Prot. Plant. Hung.*, 7 (*1952–56*), pp. 381–391, 5 fig., 1 map, 1957. [Russian and English summaries.]

The 1955 epidemic of dwarf bunt (*Tilletia inodora* [*T. controversa*]) in Hungary caused up to 10% infection in the Great Plain; the disease appeared in acid as well as in alkaline soils and always spread in thinly sown, poor plots. The existence of the disease in Hungary has been traced back to 1928, other countries known to be affected [map 297] including Yugoslavia and Bulgaria.

POLYAKOV (I. M.). К вопросу о природе действия препарата 'Родан'. [Concerning the nature of the activity of the preparation 'rodan'.]—*Trud. vsesoyuz. Inst. Zashch. Rast.*, **5**, pp. 144–154, 1954.

The effectiveness of rodan [**35**, p. 864] against loose smut [*Ustilago tritici*] of wheat is reported from many parts of the U.S.S.R., plants from treated seed usually having no infection or less than 1% as against up to 19·9% for untreated.

PURDY (L. H.). **Toxicity of hexachlorobenzene to Urocystis agropyri.**—*Plant Dis. Reptr*, **41**, 7, pp. 558–559, 1957.

In seed treatment tests at the Washington Agricultural Experiment Station,

Pullman, in 1956–7, anticarie and sanocide (40% hexachlorobenzene) [cf. **35**, p. 599] proved highly effective against flag smut of wheat (*Urocystis agropyri*) [cf. **29**, p. 554], infection percentage in the HCB treated seed being 0 and 3 in 1956 and 1957, respectively, as against 47 and 21 for the control.

Hilu (H. M.) & Bever (W. M.). **Inoculation, oversummering, and suscept-pathogen relationship of Septoria tritici on Triticum species.**—*Phytopathology*, 47, 8, pp. 474–480, 1 fig., 1957.

The information in this paper has already been noticed [**36**, p. 389].

Hopp (H.). **Untersuchungen über die Braunfleckigkeit des Weizens und ihren Erreger Septoria nodorum Berk. (Syn. Macrophoma hennebergii Kühn).** [Studies on the brown spot of Wheat and its agent *Septoria nodorum* Berk. (Syn. *Macrophoma hennebergii* Kühn).]—*Phytopath. Z.*, **29**, 4, pp. 395–412, 6 fig., 4 graphs, 1957.

S. nodorum was responsible for heavy damage to the West German wheat crop [**11**, p. 444; **31**, p. 536, and see below] in 1954–56. Of the various popular names used for the disease, 'Braunfleckigkeit' is preferred as the most descriptive. Epiphytotics develop only in humid seasons, originating from infected seed and stubble and spreading to the ears by means of pycnidiospores and mycelium. Enhanced susceptibility to *S. nodorum* is induced by delayed maturity owing to winter injury (which decimates the stands and induces the survivors to close the gaps by heavier tillering) and postponement of sowing from early Apr. to between the end of the month and mid-May.

On the basis of present knowledge only tentative recommendations can be made for control by combined hot-water seed treatment (involving 3 hr. pre-soaking at 28° C., 10 min. at 50°–51°, and a final 'shock' in tap water, followed by wind-drying at 28°) and cultural measures designed to ensure uniform ripening and prevent premature lodging. Varietal resistance is closely connected with winter-hardiness, as for instance in Carsten VI, but this and other aspects of the control problem are still under investigation at the Kiel-Kitzeberg branch of the Biological Institute.

Block (G.). **Ergebnisse von Untersuchungen über die Braunfleckigkeit (Spelzenbräune) des Weizens (Septoria nodorum Berk.).** [Results of studies on the brown spot (glume blotch) of Wheat (*Septoria nodorum* Berk.).]—*Pflanzenschutz*, **9**, 8, pp. 112–114, 1957.

The geographical distribution of *S. nodorum* [map 283] is briefly indicated. In Bavaria the fungus chiefly attacks wheat crops in river valleys. In culture sporulation was most profuse on potato and oatmeal agars at 20° C. under continuous irradiation from a 16-watt daylight tube. Pycnidia are then produced throughout the year, but the medium should be periodically changed, e.g. to malt agar. Greenhouse inoculations with a monospore culture yielded sporulating pycnidia until the end of Nov. Susceptibility to *S. nodorum* was assayed at the Institut für Acker- und Pflanzenbau der Technischen Hochschule, München-Weihenstephan, by shaking a young wheat ear in a test-tube with about 10 ml. of a spore suspension and leaving it in an inclined position. After 2 days all but 1 ml. was decanted and the tube placed by a window in a closed glass container with water. During 1954–56 numerous varieties were tested, among which the following summer wheats remained free from infection in two seasons: Frankreich (Amidonier) var. *farrum*, Balkan (Halle) var. *vulgare*, Kelcyras/Vjossa-Tal Albanien (Gatersleben) var. *eredvianum*, and Weihenstephan var. *hornemanni*. Lists are also given of the varieties rated as highly susceptible and semi-resistant.

High humidity for several days proved essential for infection, which is further promoted by growth disturbances (lodged plants being more severely attacked

than standing ones) and excessive use of nitrogenous fertilizers. Field inoculation gave moderate infection by *S. nodorum* and a yield reduction of 12·2% compared with healthy plots, attributable to poor seed development. Severe infection also impairs germination.

Control should be based on cultural methods designed to shorten the vegetative period and on the use of early-maturing varieties; crop rotation is also important. Spraying with 0·2% dithane gave practically complete control, but is uneconomic.

BURHARDT (Z. I.). **Septoria nodorum Berk.** на яровой ветвистой Пшенице. [*Septoria nodorum* Berk. on tillering spring Wheat.]—*Trud. vsesoyuz. Inst. Zashch. Rast.*, **5**, pp. 120–130, 3 fig., 1 graph, 1954.

S. nodorum was very widespread on tillering spring wheat in the Moscow region of the U.S.S.R. during 1949–50. The disease had previously been reported from the Caucasus, the Urals, Estonia, Latvia, and the Leningrad region [map 283]. Seeds are the main source of infection, which is favoured by ample moisture and precipitation in early summer. Recommended control measures include sowing as early as possible and away from other wheat crops and rye; seed treatment with granosan, which at 3 g./kg. reduced infection from 58·2 to 24·4% and increased seed yields from 9·3 to 13 c[entner]/ha.; spraying the plantings with copper oxychloride (20 kg./ha., 2 applications); and applying superphosphate (2 c./ha.), potassium chloride (2 c.), and magnesium sulphate (7 kg.) with the basic fertilizer.

HSIA (Y.-T.), HSIAO (C.-P.), & GAO (C.-X.). **Varietal resistance of Wheat varieties to Gibberella zeae headblight.**—*Acta phytopath. sinica*, **1**, 1, pp. 19–30, 1955. [Chinese. Abs. from English summary. Received 1957.]

G. zeae is prevalent on wheat [cf. **36**, p. 461] in the rice-wheat growing area of E. China, where heavy epidemics occurred in 1952 and 1954. Native varieties were generally less susceptible than the improved ones and (in 1952) those which headed early less than the late. Among the 235 varieties and hybrids studied in the field in 1952, the percentages of infected heads ranged from 0·9 to 89·1 (mostly 10–40). Hybrids 5201 and 5204 showed highest resistance, with 5·5 and 0·9% infected heads, respectively, in 1952, and 9 and 3·4% in 1954.

Greenhouse studies of 2 susceptible varieties showed that the plant is susceptible at all stages of development, infection being heavier toward maturity. Plants inoculated at the flowering stage were more heavily infected when kept at 25° C. continuously or at 25° during the day and at 15° at night than at 15° continuously.

TYLER (L. J.) & DICKENS (L. E.). **Cephalosporium leaf stripe disease of winter Wheat.**—*Plant Dis. Reptr*, **41**, 5, p. 384, 1957.

C. gramineum [**35**, p. 668] has been observed in all the counties in central and western New York where soft, white, winter wheat is grown to any extent. The fungus was re-isolated from inoculated plants of wheat, barley, and oats. Natural infection of the last two hosts has not yet been found in the area.

HIRAI (T.). **Studies on the nature of disease resistance in plants. A contribution to the knowledge concerning the mechanism of infection of plants by the weak pathogenic fungi under snow-cover and the nature of disease resistance against fungi or viruses on the basis of the results of histo- and cytochemical observations.**—*Forsch. PflKr., Kyoto*, **5**, 4, pp. 139–157, 4 pl., 2 graphs, 1956.

From the Laboratory of Plant Pathology, University of Nagoya, Japan, are reported studies on the host-parasite relationship in wheat exposed to fungal attack under snow cover. Levels of sugar and non-protein nitrogen and osmotic pressure were higher in plants resistant to snow damage, while permeability to water and urea became progressively lower in both resistant and susceptible varieties under snow. *Typhula incarnata* produced a toxin, probably a simple acidic substance, when

grown on a wheat or barley decoction or in Waksman's solution. In histological studies of resistant varieties invaded epidermal cells appeared reddish brown but the adjacent ones were alive, while in less resistant varieties the adjacent cells were dead. On entry of a hypha into a cell of a resistant variety protoplasmic granules, presumably mitochondria or microsomes, enclosed the infection site. These stained well with basic dyes after fixation by Carnoy's method. The author believes that inclusion bodies in virus infection are of a similar nature.

FITZGERALD (P. J.), STEVENS (H.), & TIMIAN (R. G.). **Barley stripe mosaic in winter Wheat.**—*Plant Dis. Reptr*, **41**, 5, pp. 392–393, 1957.

At the Aberdeen Branch Experiment Station, Idaho, barley stripe mosaic virus [**35**, p. 441] was transmitted from infected spring barley to winter wheat when the crops were grown in adjacent rows with the leaves in contact. Critical observations may be necessary to detect the disease in wheat before it becomes widespread, if it spreads as rapidly as in barley.

SĂVULESCU (T.). **Schwarzer Gerstenflugbrand (Ustilago nigra Tapke) in der Rumänischen Volksrepublik.** [Black loose smut of Barley (*Ustilago nigra* Tapke) in the Romanian People's Republic.]—*Z. PflKrankh.*, **64**, 7–10, pp. 457–469, 2 fig., 1 map, 1957. [English summary.]

Some of the information in this paper has already been noticed [**22**, p. 298, *et passim*]. From an examination of 161 samples of 2- and 6-rowed barley collected in different parts of Romania it is concluded that *U. nigra* is responsible, either alone or in combination with *U. nuda* [**35**, p. 490], for 40% of the damage caused by loose smut. The former species predominates in the more humid regions. Among other countries from which *U. nigra* has been reported are Bulgaria and the U.S.S.R.

The symptoms of the 2 smuts differ in the time of appearance and in the aspect and colour of the diseased ears in the field. The chlamydospores of *U. nuda* develop in the first half of May and those of *U. nigra* 10–12 days later. Ears attacked by *U. nuda* look ruffled because of the release of the chlamydospores in the uppermost leaf sheaths through the ruptured outer membrane. On the other hand, the chlamydospores of *U. nigra* are not usually liberated until the ears have emerged from the uppermost leaf sheaths and a compact appearance is consequently retained. In 80–90% of the ears observed the identity of the species could be determined by the colour—brown in the case of *U. nuda* and dark chocolate-coloured or even black in that of *U. nigra*. Smutted plants produced fewer lateral shoots (4 at the most) than healthy ones; some consisted merely of a single haulm with an infected ear.

In inoculation experiments with chlamydospores of the two species on treated seed of Cenad 395, only *U. nigra* caused appreciable infection (up to 8·2%). Floral infection was best achieved by the injection of spore suspensions when the ear was half-way up the top leaf sheath, the maximum incidence for *U. nuda* at this stage being 82·1 and for *U. nigra* 10·2%.

On the basis of these studies it appears likely that *U. nigra* could be effectively combated by the hot-water or chemical seed treatments used against *U. hordei*.

LEE (T.-C.). **A preliminary study on the stripe disease Helminthosporium gramineum of Barley.**—*Acta phytopath. sinica*, 1, 2, pp. 169–176, 1955. [Chinese. Abs. from English summary. Received 1957.]

In the lower Yangtze valley, China, *H. gramineum* [**24**, p. 361] is spread mainly by infected seed. Early winter sowing can check the development of the disease as it is favoured by low soil temperature. Ceresan, granosan, and hot water are more effective as seed treatments than uspun [? uspulun] and ferrous sulphate.

Scott (K.), Millerd (Adele), & White (N. H.). **Mechanism of resistance in Barley varieties to powdery mildew disease.**—*Aust. J. Sci.*, **19**, 5, pp. 207–208, 1957.

At the Dept of Biochemistry, University of Sydney, extracts from barley leaves infected by *Erysiphe graminis* [**36**, p. 523] were found to contain a substance, termed the 'Respiratory Factor' [RF], which was purified by chromatography and by ion-exchange resins. Both crude and purified preparations induced increased respiration (oxygen consumption and carbon dioxide output), cell collapse, and necrosis of non-infected leaves.

A phenolic compound with marked fungistatic properties was isolated in the course of purification of the RF. It was present in both non-infected and infected semi-resistant and susceptible varieties, and its release, along with other cytoplasmic and vacuolar constituents, into the intercellular spaces may well be associated with cell collapse. The phenolic compound eventually accumulates round the haustoria of the invading fungus and causes complete cessation of growth.

It appeared that cell collapse, an essential of resistance, might induce resistance in a susceptible variety, and this object was, in fact, achieved by brushing the leaves with the RF shortly before inoculation.

The powdery mildew cycle, then, may be outlined as follows. In resistant varieties the increase in respiration following the formation of the RF results in cell collapse and the liberation of the phenolic compound as described above. In susceptible varieties, on the other hand, there is no cell collapse, apparently because of insensitivity to the RF at the concentration occurring at infection, and consequently no release of the phenolic compound impeding further advance of the pathogen.

Campbell (W. P.). **Infection of Barley florets by Claviceps purpurea Tul.**—Abs. in *Proc. Canad. phytopath. Soc.*, **24**, pp. 18–19, 1956.

At the Plant Pathology Laboratory, Edmonton, Alberta, Newal barley was inoculated in the greenhouse by atomizing a spore suspension on to the florets during the flowering period. Florets removed at 24-hr. intervals showed that by the 3rd day the mycelium was well established around the base of the ovule. Thence it grew upward and by the 6th day the ovule had become an islet of intact tissue surrounded by the fungus. At about this stage penetration of the nucellus and embryo sac occurred, simultaneously with that of the epidermis of the ovary wall, on which a layer of conidiophores soon developed. As a rule 'honey dew' was secreted within 7 days and sclerotia had formed before the end of the 2nd week.

Allen (T. C.). **Strains of the Barley yellow-dwarf virus.**—*Phytopathology*, **47**, 8, pp. 481–490, 2 fig., 4 graphs, 1957.

The information in this paper from the University of California, Davis, here presented in detail, has already been noticed [**36**, p. 395]. Mixtures of the strains of the virus produced by simultaneous inoculation with the aphid vector *Rhopalosiphum prunifoliae* [**37**, p. 37] could be separated by aphid transfer to separate hosts. There was, however, no evidence of natural mixtures. No cross-protection between strains was observed, but its occurrence is not entirely ruled out.

Grasso (V.). **Un metodo per la conservazione delle colture dei carboni dell' Avena.** [A method for the preservation of cultures of Oats smuts.]—*Ric. sci.*, **27**, 1, pp. 88–91, 1957. [French, English, and German summaries.]

This information on *Ustilago avenae* and *U. hordei* has already been noticed [**36**, p. 582].

Hooker (A. L.). **Septoria reactions of Oat varieties and selections in 1956.**—*Plant Dis. Reptr*, **41**, 5, pp. 385–388, 1957.

In inoculation experiments at Madison, Wisconsin, in 1956 on the reaction of 257 oat strains to *S. avenae* [*Leptosphaeria avenaria*: cf. **35**, p. 762], Clinton, Vicland, and

other Victoria-Richland derivatives, and Hawkeye-Victoria derivatives were frequently one or more parents of the resistant selections. As differences in reaction to the disease were wide, significant, and fairly consistent in the 2 years of test, they can be considered as inherent.

Hooker (A. L.). **Methods of inoculation and determining varietal reactions in the Septoria disease of Oats.**—*Plant Dis. Reptr*, **41**, 7, pp. 592–597, 1957.

The best method of inoculating oat varieties in the greenhouse with *S. avenae* [*Leptosphaeria avenaria*] was found at the U. S. Dept of Agric., Madison, Wisconsin, to consist in blending 7–9-day-old sporulating cultures on potato-dextrose agar with water. The suspension is passed through one thickness of cheese cloth and atomized on to the plants at 15 lb. pressure. For field spraying the inoculum is diluted 1:5 with water and a wetting agent (e.g. tween 20) added. The best infection results on wet leaves. Varietal differences in lesion size are correlated with total leaf infection and appear to be an expression of resistance; they are quantitative and depend on environmental conditions.

Hooker (A. L.). **Cultural variability in Septoria avenae through successive single-macrospore transfers.**—*Phytopathology*, **47**, 8, pp. 460–468, 2 fig., 1957.

Studies were made at the University of Wisconsin, Madison, in conjunction with the U. S. Dept of Agric., of 3–11 successive generations of monospore subcultures of *S. avenae* (*Leptosphaeria avenaria*) derived from single-macrospore cultures of 4 strains of the fungus. Growth was on potato-dextrose agar in tubes. Considerable variability occurred [cf. **32**, p. 248] up to the 3rd or 4th generation, after which greater uniformity ensued, and stable types were obtained. These latter sometimes arose suddenly as single variant cultures; in other cases 6 generations were needed to obtain stability. Some stabilized cultures remained so after 5 months' storage at 10° C. and after mass-spore transfers. Variable cultures sometimes yielded new stable types after successive single-spore transfers.

Cultural variability was unaffected by passage through oat seedlings, and the families from two of the original isolates proved less variable than the others. In one family, subcultures from spore germ-tube tips were as variable as those from spores. Stable cultures originating from single macrospores or from germ-tubes differed in their pathogenicity to oat seedlings. Maintenance of isolates of *L. avenaria* in culture for 3 years increased variability as compared with 1 year.

It is considered that despite initial variability cultures from single macrospores can develop considerable cultural stability by successive single-spore transfers. Theoretically the observed variability could arise from continuing mutation and subsequent vegetative association of differing nuclear types within a heterocaryotic system, the eventual attainment of uniformity arising from a chance dissociation of genetically alike nuclei during spore formation.

Rosen (H. R.). **Epidemics of powdery mildews in Arkansas in 1956 with special reference to powdery mildew on winter Oats.**—*Plant Dis. Reptr*, **41**, 4, pp. 330–336, 1957.

A severe epidemic of powdery mildew (*Erysiphe graminis*) on cereals in 1956 at the Main Agricultural Experiment Station farm, Fayetteville, Arkansas, was the first epidemic of the disease on oats in the State. The reaction of a large number of varieties of winter oats to the pathogen is listed. Amongst well-known varieties Victorgrain 48–93 and Red Rustproof showed a high degree of resistance, as did many of the numbered breeding varieties [cf. **32**, p. 675].

Endo (R. M.) & Brown (C. M.). **Effect of yellow dwarf on the yield of Oats.**—*Agron. J.*, **49**, 9, pp. 503–505, 1 fig., 1957.

In joint work at the Crops Research Division, U. S. Dept of Agric., and Illinois

Agricultural Experiment Station, Urbana, 3 varieties of oats were inoculated by means of the vector, *Rhopalosiphum prunifoliae*, with a moderately virulent strain of the barley yellow dwarf virus [cf. **36**, p. 238; **37**, p. 35]. The average infection in the uninoculated controls and in plants inoculated at the 3-leaf and boot stages was, respectively, 1·1, 93·8, and 15·6%. The yield reductions were: Fayette, 92·5 and 10·1%; Clintland, 94·4 and 21·8%; and Rodney, 75·8 and 15%.

When infection occurred in the 3-leaf stage, loss of yield resulted mainly from a reduction in the number of spikelets per panicle and the number that produced kernels; test weight and kernel weight were also reduced. When the plants were inoculated in the boot stage, the number of spikelets that produced kernels was reduced, with only a slight reduction in kernel weight and test weight.

Proceedings of the Second Annual Conference of the Professional Officers of the Department of Research and Specialist Services, Federal Ministry of Agriculture, Rhodesia and Nyasaland.—95 pp., 5 graphs, Salisbury, Southern Rhodesia, The Government Printer, 1956. [Received 1957.]

Two papers at this conference devoted to maize production in Southern Rhodesia and held at Gwebi Agricultural College, 19–20 Mar. 1956, dealt with diseases. On the subject of ear and cob rots W. E. Kerr (pp. 15–20) pointed out that there is as yet no accurate estimate of losses from this cause, which has been overshadowed recently by the widespread incidence of leaf blight [*Helminthosporium turcicum*: **36**, p. 380]. The chief pathogens in order of virulence are *Diplodia zeae* [*D. maydis*], *Gibberella zeae* (*Fusarium graminearum*), *Gibberella fujikuroi* var. *subglutinans* (*F. moniliforme* var. *s.*), and *G. fujikuroi* (*F. moniliforme*). In order of prevalence these are reversed. *D. maydis* ('*Diplodia*' rot, grey rot, dry rot, or brown rot) is seasonal and most prevalent in years that are wet at the end of the growing season. The symptoms of various strains of the fungus range from a profuse white surface mycelium to a brown rotting and shrivelling with little mycelium evident. As infected grains rarely germinate, seed treatment is of slight value. *G. zeae* is more prevalent than *D. maydis*, but varies similarly in its incidence. Heavily infected grain is rotted, as also is the cob. Lightly infected seed germinates, but the seedlings are liable to be diseased and in this case seed treatment with agrosan is useful. The author considers that *G. fujikuroi*, the commonest of these pathogens, is predominantly a wound parasite following insect damage to the ear. Numerous 'wild types' exist, unstable in culture and varying in pathogenicity and sometimes in the grain symptoms. Isolates of *G. f.* var. *subglutinans* from seed in 1951 were more pathogenic than *G. fujikuroi*. As separation of *G. fujikuroi* and its var. *subglutinans* on infected grain is difficult, and because maize strains apparently react similarly to both of them, only the former is tested. The symptoms produced by the 4 pathogens in grain in the sand germinator are briefly summarized. In Southern Rhodesia losses due to root or stalk rot are of little consequence, the latter perhaps owing to the selection of types with strong stalks and a hard rind to resist lodging, and losses due to ear rot and seed rot predominate. *D. maydis* and *G. zeae* have been observed causing seedling blight in the field and also in the laboratory, but *G. fujikuroi* has not. From experimental results it seems that infected soil-borne debris seldom produces disease.

In testing maize strains for their reaction to ear-rotting pathogens a previous sheath wound inoculation technique proved unreliable, and spraying the silk and sheath with an atomized spore suspension was substituted. Certain strains susceptible to the former method proved resistant by the latter, and vice versa, but there was less variability in their reaction to the various pathogens, suggesting the possibility of testing maize for its reaction to the principal ear- and cob-rot fungi with only one pathogen.

In preparing spore suspensions for atomizing the pathogens are bulked by

incubation on sterile oats (on which *D. maydis* and *G. fujikuroi* sporulate profusely) which are then kneaded in water, filtered, and made up to the requisite concentration. The stage at which this is done is important as spores of *D. zeae* lose viability 3 weeks after reaching maturity. The suspension is sprayed on to the silks and sheath at approximately 50 ml./ear, sufficient pressure to ensure penetration being essential. *G. zeae* has been inoculated into the ears by placing an infected oat grain in the tip or among the silks, and subsequent bagging has been discontinued.

For the assessment of grain rot, a laborious task, complicated by insect damage, 3 different methods are being compared, based on (1) the number of ears/plot showing evidence of rotting, (2) the area of the plot showing evidence of rotting, and (3) the number of grains rotted in representative samples. Early planting is also essential for inoculation to coincide with the peak rains, and to escape, if possible, excessive borer damage either very early or very late in the season. The inbreds A 576 and N 2656, which had shown promise when tested by the wounding method, proved very susceptible when the silks were inoculated.

Some of the information on leaf diseases given by G. W. Herd (pp. 21–25) has already been noticed [**36**, p. 240]. A succession of good rainy seasons since 1951, together with the susceptibility of most hybrid strains in Southern Rhodesia, has favoured them, and particularly the build-up of inoculum of *H. turcicum*. Preliminary trials of inbred and hybrid lines for resistance to leaf blight and rust (*Puccinia sorghi*) [**34**, p. 437] were carried out during 1950–53, and subsequently much material from Southern Rhodesia and other African territories was examined for resistance to *H. turcicum* and *P. polysora*. Leaf blight is by far the most important leaf disease of maize in Southern Rhodesia. *P. sorghi* does little damage but *P. polysora*, a comparative new-comer, sometimes causes appreciable losses. Downy mildew (*Sclerospora sorghi*), a potentially serious disease, has been recorded only at the Sabi Valley Experiment Station.

There is evidence for physiological races of *H. turcicum*, an isolate from *Sorghum* (which is also attacked) failing to infect maize. This fungus progressively eliminates the effective leaf area, which process has its maximum effect on yield when occurring at the full tassel stage, a result arising from early infection. Leaf blight can be effectively controlled only by the use of resistant hybrids, but trash, in which the fungus can overwinter, should be ploughed under.

Inoculum required to test for resistance is started on 2% potato dextrose agar and thence inoculated into 1-l. flasks half-filled with autoclaved oats, which are dried and ground to a fine dust when the fungus has grown through them. Weekly inoculations from the time the plants reach 18 in. until tasselling are performed by placing a pinch of this dust in the leaf whorl to achieve a high infection by silking time and permit selection before pollination. This method has worked well at Salisbury. Of inbred material tested N 3–2–3–3 possesses a considerable degree of resistance which is transmitted to the single crosses in which it has been used, i.e., 51 H 39 (N 3–2–3–3 × M 9–9–5) and 51 H 37 (N 3–2–3–3 × A 5–7–6). During the 1954–5 season material from Kenya, West Africa, Nyasaland, and Natal was also examined.

Altitudes above 4,000 ft. are unfavourable to *P. polysora*, and infection does not occur until the plants are mature; below this the onset of the disease is progressively earlier and it is worst from 3,000 ft. downwards. Rainfall is of decisive importance; in the 1953–4 season it was low at the Sabi station (12·34 in.) and the rust did not appear until 24 Mar.; in 1954–5, with good, evenly distributed rain, the first outbreaks were noted in mid-Feb.; in 1955–6 the disease was first recorded on 1 Mar., its appearance having presumably been delayed by a prolonged dry spell in Jan. Absence of attack before tasselling is in contrast with West Africa, where the disease occurs on plants at all stages, but once infection has taken place spread and develop-

ment are rapid. In variety trials at Sabi all the Southern Rhodesian material has proved susceptible, and resistance may become a necessity for low veldt areas such as the Sabi valley.

Maize streak virus [**14**, p. 626] has never been of serious consequence in the main maize areas, and its restriction to the eastern low veldt may be due to the habitat requirements of its vector [*Cicadulina mbila*]. The highest percentages of streak were observed in plots bordering on waterlogged parts of the veldt; the increase of the vector as the season progresses can be countered by early planting. At Sabi resistance to streak virus has been incorporated into the Salisbury inbred N 3–1–4–9; of a number of Sabi inbred lines assessed for streak resistance during the 1954–5 season KO 5, NA, NB, K 11, and KV 1–1 showed no infection.

Turian (G.). **Sur la tumeur ustilaginienne du Maïs et son activité phosphatasique.** [On the ustilaginaceous tumour of Maize and its phosphatase activity.]—*Arch. Sci., Genève*, N.S., **9**, 4, pp. 465–471, 1 fig., 1 diag., 1956.

At the Institut de Botanique Générale, Geneva, the phosphatase activity of the maize galls induced by *Ustilago zeae* [*U. maydis*] was compared with tissue from the stem parenchyma, using a glycerophosphate substrate in pH 5·1 acetate buffer. After 30 min. incubation at 37° C., 1·1 mg. P/g. dry tissue was liberated from the healthy material as against 2·6 mg. from the gall-bearing [cf. **36**, p. 485]. Chromatography demonstrated the absence of β-indolylacetic acid, originally suspected to be implicated in the development of maize galls. Proliferation of the excrescences is probably attributable to the presence of ustilagine (amino base) produced by the smut [cf. **22**, p. 301].

Rafailă (C.) & Tusa (C.). **Influența tratamentului semințelor de Porumb cu microelemente asupra infecției produsă de ciupercile Ustilago zeae (Beckm.) Ung. și Sorosporium holci-sorghi f. zeae (Pass.) Săvulescu.** [The influence of seed treatments of Maize with trace elements against infections produced by the fungi *Ustilago zeae* (Beckm.) Ung. and *Sorosporium holci-sorghi* f. *zeae* (Pass.) Săvulescu.]—*Comun. Acad. Repub. pop. rom.*, **7**, 3, pp. 383–388, 1957. [Russian and French summaries.]

At an experiment station in Romania the treatment of maize seed with 0·5% zinc sulphate or sodium chloride stimulated growth. The former compound was particularly effective, increasing yields by 9·1 and 13·8% in 1955 and 1956, respectively, and contributing to a breakdown of the parasite-host equilibrium. Among the insectifungicides tested the most efficient were TMTDS [thiram] at 300 g./kg. seed and mercuran (100 g. in 1955, 50 g. in 1956), which substantially reduced the incidence of infection by *U. zeae* [*U. maydis*: **16**, pp. 19, 738] and *S. holci-sorghi* f. *zeae*.

Jenkins (Merle T.), Robert (Alice L.), & Findley (W. R.). **Reaction of inbred lines of Corn to Helminthosporium turcicum Pass. in different seasons.**—*Agron. J.*, **49**, 9, pp. 481–483, 1957.

At the Plant Industry Station [Beltsville, Maryland] 58 inbred lines of maize were compared under heavy epidemics of *H. turcicum* [**36**, p. 758] artificially induced by repeated inoculation with a mixture of isolates from various States. Highly significant differences occurred among the different lines and the seasons (1951–56). Some lines were highly resistant in all seasons. The most resistant were L 97, H 856, and CI. 15, others with consistently good records being Pd 2029, Pd 2287–2, Pd 2289, B 3510, 3–431–2–3–2–B, and Oh 4 C.

Michaelson (M. E.). **Factors affecting development of stalk rot of Corn caused by Diplodia zeae and Gibberella zeae.**—*Phytopathology*, **47**, 8, pp. 499–503, 3 graphs, 1957.

Studies were made during 1950–52 at the University of Minnesota, St. Paul, of the

effect on yield and the predetermining factors of stalk rot of maize due to *D. zeae* [*D. maydis*] and *G. zeae* [**36**, p. 692] on Minhybrids 504 and 607. Over the 3 years yields were reduced from 3 to 18%, according to circumstances. No antagonism or synergism was caused by simultaneous inoculation with the 2 species, using 2 strains of each. Plants grown in flooded plots, and others with the ears removed, suffered less than the controls. In the greenhouse more rot developed at 85° than at 65° F. Plants affected by smut (*Ustilago maydis*) proved more susceptible. Susceptibility continued over a long period, its maximum continuing from just before pollen production to maturity. Mechanical damage to simulate that by borers had no apparent effect, though these give rise to infection courts. Removal of leaves to simulate leaf blight [*Helminthosporium turcicum*] somewhat increased infection. Early infection did not augment the damage caused by subsequent attack by the same organism.

Finley (A. M.). **Wheat streak mosaic, a disease of Sweet Corn in Idaho.**—*Plant Dis. Reptr*, **41**, 7, pp. 589–591, 1 fig., 1957.

Wheat streak mosaic virus [**35**, p. 439] has been found since 1951 on maize in Idaho. Affected plants are pale yellow, and their distribution indicated a wind-borne vector, but *Aceria tulipae* was not found. Initial small chlorotic spots or broken streaks on the tips of the apical leaves elongate between the veins. Older leaves often become terminally completely chlorotic except near the larger veins, but there is no necrosis. The disease is not seed transmitted. It seems likely that highly resistant strains of Golden Cross Bantam can be obtained by suitable selection and mating of inbreds.

Hsi (C. H.). **Varietal differences in susceptibility of Sorghum to chemical toxicity of a mercury compound (panogen 15).**—*Plant Dis. Reptr*, **41**, 4, pp. 312–316, 1 fig., 1957.

At New Mexico Experiment Station 18 varieties of sorghum were tested for the phytotoxic reaction of the seed to the mercury compound panogen 15. At $\frac{3}{4}$ fluid oz./bush. most of the varieties showed slight or insignificant injury, but at 3 oz./bush., considerable injury was evident. Emergence of 18 varieties treated at the high rate was 1–85% and seedling injury 7–100%. Sorgo, milo, and hegari types were more tolerant of toxicity than kafir or kafir-milo hybrids or derivatives. Several tolerant varieties could withstand dosages as high as 6 oz./bush.

Moriondo (F.). **La peronospora del Panico.** [Downy mildew of Millet.]—*Agricoltura ital.*, **57** (N.S. 12), pp. 99–111, 4 fig., 1957. [60 refs. French summary.]

After stating that millet (*Setaria italica*) growing near Pistoia, Italy, is every year attacked by *Sclerospora graminicola* [cf. **16**, p. 527], which sometimes causes a one-third loss in yield, the author briefly reviews what is known of the disease in the various countries in which it occurs. Attempts are in progress to find a suitable method of control.

Baines (R. C.), Small (R. H.), DeWolfe (T. A.), Martin (J. P.), & Stolzy (L. H.). **Control of the Citrus nematode and Phytophthora spp. by vapam.**—*Plant Dis. Reptr*, **41**, 5, pp. 405–414, 3 fig., 1957.

This information has already been noticed [**36**, p. 584].

Grant (T. J.). **Effect of heat treatment on tristeza and psorosis viruses in Citrus.**—*Plant Dis. Reptr*, **41**, 4, pp. 232–234, 1957.

Hot-water treatments [**36**, p. 316] have not proved satisfactory for freeing citrus budwood from virus infection [cf. below]. In trials by the U. S. Dept of Agric. exposure of virus-infected plants in a heat chamber to temperatures of 95–110° F.

for 40–107 days indicated that the new growth was free from the virus, but not the old leaves and stem tissues.

Desjardins (P. R.), Wallace (J. M.), Lange (C. T.), & Drake (R. J.). **The suppression of tristeza virus symptoms in Mexican Lime seedlings by heat treatment.**—*Plant Dis. Reptr*, **41**, 4, pp. 230–231, 1957.

At the Citrus Experiment Station, Riverside, California, tristeza virus leaf symptoms on Mexican lime seedlings [**36**, p. 22] were suppressed when infected plants were conditioned for 10 days at 28–36° C., then held for 3–4 weeks at 40° with alternating periods of light and darkness [cf. above]. After 4 weeks the new growth of the treated plants was approximately double that of the infected controls kept in a greenhouse at a maximum of 30°. No difference was observed between virus-free seedlings grown at the 2 temperatures and it is concluded that the improved growth at 40° was due to the effect of treatment on the virus rather than on the host.

Plants returned to the greenhouse after treatment developed virus symptoms on some previously symptomless younger leaves which were more severe than those on the untreated controls, suggesting that the leaf tissues involved had been completely free from virus at the end of the treatment.

Wallace (J. M.). **Tristeza and seedling yellows of Citrus.**—*Plant Dis. Reptr*, **41**, 5, pp. 394–397, 1 fig., 1957.

Indexing on Eureka lemon seedlings in California showed that the virus causing seedling yellows [**36**, p. 694] is carried by Meyer lemon, Satsuma orange, and other varieties of citrus (8 of the 14 sources tested) believed to have been infected by tristeza when introduced into the United States [**35**, p. 764]. One month after grafting, the new growth on the Eureka seedlings showed evidence of seedling yellows. The virus does not appear to be present in California on sweet orange naturally infected by tristeza by means of insect transmission. The probability that the virus causing seedling yellows is a strain of tristeza is being investigated.

Reitz (H. J.) & Knorr (L. C.). **Occurrence of Rangpur Lime disease in Florida and its concurrence with exocortis.**—*Plant Dis. Reptr*, **41**, 4, pp. 235–240, 4 fig., 2 graphs, 1957.

It is noted that the etiological agent of Rangpur lime disease [**35**, p. 888], now recognized in Florida, appears to be the same as citrus exocortis virus in trifoliate orange. Its incubation period in Florida is similar to that reported from Brazil and Texas, but is shorter than in California. The rate of scaling is greater in trifoliate orange than in Rangpur lime, and on the latter but few trees are affected.

Lin (K.-H.). **Observations on yellow shoot of Citrus. Etiological studies of yellow shoot of Citrus.**—*Acta phytopath. sinica*, **2**, 1, pp. 1–42, 8 pl., 3 diag., 1 graph, 1956. [Chinese. Abs. from English summary. Received 1957.]

The destructive yellow shoot disease of citrus is most serious in the Chaoshan and Yuehchung district of Fukien; in Chaoshan it has been known for 70 years and became epiphytotic 30 years ago. Nearly all species of citrus are susceptible. Symptoms include yellowing of nearly mature, new shoots, leaf fall, and rotting of rootlets. Malformation of the leaves is common on sweet orange, together with shortening of the internodes and downward as well as upright growth of the shoots. On shoots formed later the midrib and lateral veins of the leaves turn yellow and may become enlarged, corky, and split. Affected trees bloom early and profusely but bear few fruits; these may be deformed. Young trees of less than 7 years are killed within 1–2 years. Nursery trees are killed more quickly and although older

trees decline less rapidly they become unproductive 2 years after the first symptoms appear.

In field experiments there was no evidence of direct relationship between water injury and development of the disease or that it was caused by nematodes. *Fusarium* spp. were not responsible but could invade roots already weakened. Inoculation by budding indicated that the disease is of virus origin, and transmitted naturally. It was shown to be carried by nursery trees when diseased and healthy trees were inter-planted. Strict quarantine is recommended to prevent further spread as there is no other known means of control.

RODRÍGUEZ (R. A.), BIANCHINI (C. A.), & SOTO (C. A.). **Studies on the control of 'derrite' disease of Coffee caused by Phyllosticta coffeicola Del.**—*Plant Dis. Reptr*, **41**, 7, pp. 560–563, 2 fig., 1957.

A new coffee disease, known locally as 'derrite' and caused by *P. coffeicola*, was recently observed in the highlands of Costa Rica and has since spread to the central plateau. The chief symptoms are leaf or twig lesions, the latter rapidly killing the apical bud and the first pair of leaves, but stopping as lignified tissue is reached. On the leaves, lesions appear as irregular, rounded, apical or marginal spots with concentric ridges, or as circular spots which may lose their centres; at first black or very dark brown, the lesions later turn a rusty colour, and in humid conditions the fungus sporulates on them.

FRANCO DO AMARAL (J.), TEIXEIRA (C.), & PINHEIRO (E. D.). **O bactério causador da mancha aureolada do Cafeeiro.** [The bacterium causing halo blight of Coffee.]—*Arq. Inst. biol., S. Paulo*, **23**, pp. 151–155, 1956. [English summary. Received Oct. 1957.]

Pseudomonas garcae Amaral, Teixeira & Pinheiro is the name assigned to the organism responsible for halo blight of coffee in the Garça region of São Paulo, Brazil [**36**, p. 643], where it also induces similar necrotic symptoms on citrus, potato, tomato, *Solanum paniculatum* var. *acutilobium*, bean (*Phaseolus vulgaris*), *Ligustrum lucidum*, and olive. The bacterium develops on peptone and meat extract agars as small rods or in short chains. On the former medium the colonies, 2–3 mm. diam. after 48 hr., are circular, convex, pale ash-coloured, and butyrous, with a smooth surface. Gelatin is liquified and litmus milk alkalinized. Good growth (without acid or gas production) is made on maltose, glucose, raffinose, sucrose, lactose, arabinose, galactose, xylose, and laevulose. The optimum temperature is 30–35° C. *Coffea eugenioides* and *C. excelsa* are mentioned as experimental hosts.

SADASIVAN (T. S.). **Uptake of ions and metallic chelation in plants.**—*Proc. Indian Acad. Sci.*, **45**, Sect. 13, 1, pp. 1–8, 1957. [51 refs.]

The author reviews the role of trace elements and of their chelation by vivotoxins [**36**, p. 695] in determining the susceptibility of cotton to *Fusarium* wilt (*F. vasinfectum*).

ERWIN (D. C.), SAPPENFIELD (W. P.), & KORTSEN (R.). **Effect of some fungicides on seedling diseases of Cotton in the irrigated desert valleys of Southern California.**—*Plant Dis. Reptr*, **41**, 4, pp. 324–329, 1957.

In experiments by the University of California in co-operation with the U. S. Dept of Agric., *Rhizoctonia* [*Corticium*] *solani*, alone in 1954 and together with *Pythium* sp. in 1956, was incorporated in the soil before planting cotton seedlings. PCNB alone proved as effective in controlling *C. solani* as when combined with other fungicides; zineb proved nearly as good in 1956, but not in 1954. Various factors of disease distribution and high salt concentrations complicated the tests, and *Pythium* sp. did not prove pathogenic.

WHITEHEAD (M. D.) & BROWN (N. E.). **In-the-furrow application of fungicides for the control of Cotton seedling disease—damping-off and nub-root.**—*Plant Dis. Reptr*, **41**, 5, pp. 419–423, 1 fig., 1957.

At the Missouri Agricultural Experiment Station 10 fungicides were applied separately and in combination to the furrows at sowing time as protectants against the cotton seedling disease complex [**36**, p. 469]. In 1955 some of the seed was inoculated with *Rhizoctonia* [*Corticium*] *solani*, some with *Fusarium* spp., and some with *Pythium* spp., and in 1956 with a mixture of all these fungi. Ceresan and panogen reduced germination in 1955, but when the dosage of panogen was reduced to 2·5 pints (from 5 pints in 1955) it increased stand and yield. In 1956 captan 50% W.P. (5 lb./acre), nabam (5 qt.), and nabam (4) plus PCNB (4) or zinc sulphate (0·5 lb.) improved stands and increased yield at the first picking to more than twice that from untreated plots. Plants given advantage by control of the fungi made an early, healthy start, early fruiting was promoted, and a larger proportion of the crop produced at the first picking when quality and prices were higher. Nub-root symptoms [**35**, p. 14] were considerably decreased when fungicides were used with both inoculated and non-inoculated seed.

YIN (S.-Y.), CHEN (C.-T.), YANG (K.-Y.), CHEN (D.), & KENG (D.-C.). **A preliminary study on the selection and culture of antagonists for some Cotton disease organisms with reference to their field performance.**—*Acta phytopath. sinica*, **1**, 1, pp. 101–114, 1 graph, 1955. [Chinese. Abs. from English summary. Received 1957.]

Of the 1,205 actinomycetes isolated during 1950–54 in various parts of China 42·7% were antagonistic to *Verticillium albo-atrum*, 35–45% to *Fusarium vasinfectum*, 25·2% to *Rhizoctonia* [*Corticium*] *solani*, and 33·2% to *Pythium* spp., all infecting cotton. The slowly sporulating isolates were generally the most active and those antagonistic to *C. solani* were usually highly antagonistic to the other fungi. In the preparation of cultures for large-scale field application cotton seed cake (oil extracted) mixed with soil (1:4–1:8) was the best substrate, with 2·5% inoculum growth being best at 24° C., 21% R.H., and pH 6·5–8·5. In the field this preparation reduced seedling root rot and *Verticillium* wilt and increased yield.

YIN (S.-Y.), CHEN (C.-T.), YANG (K.-Y.), & CHEN (D.). **Studies on the control of the diseases of Cotton seedlings.**—*Acta phytopath. sinica*, **1**, 1, pp. 115–126, 2 graphs, 1955. [Chinese. Abs. from English summary. Received 1957.]

Recent studies in China showed that the hot-water treatment of cotton seeds results in both disinfection and selection, immature seeds or those of low viability being less resistant. Treatment of mature seed at 55–65° C. for 30 min. reduced seedling infection [unspecified] from 68 to 0–9% without impairing germination, at 50–55° the number of diseased seedlings was reduced to $\frac{1}{3}$–$\frac{1}{4}$, and germination of immature seed was fair. A modification of the farmers' method, 3 parts boiling water being added to 1 part cold (12–18°) to give an initial temperature of 69–72°, falling to 52° after 30 min. when the proportion of seed: water was 1:2½ (w/w), reduced seedling disease and increased yield. Dusting with 0·8% ceresan or 3% zinc oxide or with antibiotic preparations after the heat treatment improved control.

NAIR (P. N.). **Factors affecting resistance of Flax to Fusarium lini Bolley.**—*Diss. Abstr.*, **17**, 5, p. 942, 1957.

In histological studies at the University of Minnesota *F. lini* was found to enter the micropyle or wounds in the testa of flax seeds, subsequently invading the cotyledons and, in susceptible varieties, the radicle also. The pathogen entered root hairs and other epidermal cells and, in susceptible varieties, penetrated the xylem

and phloem, the latter being subsequently disintegrated and replaced by hyphae; in a resistant variety invasion was restricted to the cortex.

Each of 4 races of *F. lini* behaved differently when inoculated via the stem into each of 7 flax varieties, the growth of a given race in a given host being proportional to the susceptibility of the variety to inoculation via the soil. The growth of the pathogen on media incorporating sterile extracts of flax was not correlated with the susceptibility of the variety in question.

In 3 varieties the incidence of wilt was higher at a soil pH 5·5–7·5 than at higher or lower levels. N and K reduced wilt, while P either increased it or was without effect. Spraying with 2,4-D, MCP (2-methyl-4-chlorophenoxyacetic acid), and TCA (trichloroacetic acid) increased the percentage of wilt in plants growing in infected soil in the greenhouse. Growth of the pathogen *in vitro* was stimulated by MCP at concentrations of 100–200 p.p.m. but inhibited at 500 p.p.m. Seedlings of B 5128 and Redwood lost all or much of their resistance when maleic hydrazide, thiourea, or, particularly, 2,4-dinitrophenol were added to the soil, the effect being proportional to concentration. Since growth of the pathogen *in vitro* in the presence of these substances was not correlated with the severity of wilt at corresponding concentrations it followed that their effect was on the host.

It was concluded that resistance is inherited [cf. **35**, p. 16], but that it can be modified by external factors.

Handbook on bulb growing and forcing for bulbous Iris, Easter Lilies, Hyacinths, Narcissus, Tulips.—176+20 pp., 89 fig., Northwest Bulb Growers Association, Mt. Vernon, Washington, 1957. $2.50.

The various sections of this useful publication are contributed by a number of authors, virus and fungus diseases being dealt with by F. P. McWhorter and C. J. Gould, respectively. The symptoms of each disease are described and control methods outlined, and the whole is well illustrated. There is a glossary of technical terms.

Broadbent (L.), Green (D. E.), & Paton (J. B.). **Virus diseases in the Narcissus trial at Wisley.**—*J.R. hort. Soc.*, **82**, 9, pp. 395–401, 1 diag., 1957.

Stripe [*Narcissus* mosaic virus] is stated to be the most common virus disease of *Narcissus* at the Royal Horticultural Society's Gardens, Wisley, where it is checked by spring roguing [cf. **32**, p. 128], details of which are given. Spraying to control vectors proved unsuccessful; use of barrier plants was effective, but inconvenient for purposes of display.

Plakidas (A. G.). **Camellia petal blight found in Texas.**—*Plant Dis. Reptr*, **41**, 6, p. 547, 1957.

Petal blight (*Sclerotinia camelliae*) [**36**, p. 321] is recorded on camellia in Texas.

Stoddard (E. M.). **A Fusarium rot of Geraniums and its control.**—*Plant Dis. Reptr*, **41**, 6, p. 536, 1957.

At the Connecticut Agricultural Experiment Station, New Haven, a species of *Fusarium* proved to be an active pathogen of geranium [*Pelargonium*] cuttings, causing a form of 'black leg' appearing as a coal-black rot distinct from the brownish-black rot of *Xanthomonas pelargonii* [**35**, p. 457]. Soil drenches of 250 p.p.m. oxyquinoline sulphate with 200 p.p.m. streptomycin controlled both diseases.

Sisler (H. D.), Chang (S. C.), Reagan (R. L.), & Brierley (P.). **Purification and properties of Hydrangea ringspot virus.**—*Phytopathology*, **47**, 8, pp. 491–494, 1 fig., 1957.

Purification of hydrangea ring spot virus [**36**, p. 406] by ammonium sulphate pre-

cipitation and differential centrifugation at the University of Maryland, College Park, in conjunction with the U. S. Dept of Agric., showed it to consist of 2 electrophoretic components. The infectious, fast-moving component, with rod-shaped particles, had an ascending mobility of $-3{\cdot}9 \times 10^{-5}$ sq. cm./volt/sec. at pH 7; the slow-moving component, non-infectious and without rods, had a descending mobility of $-1{\cdot}7 \times 10^{-5}$ sq. cm./volt/sec. The mean width of particles was 16·3 mμ and the length 44 mμ and upwards. The infectivity titre, optical density at the ultraviolet absorption maximum (260–5 mμ), and protein concentration of infectious preparations were correlated.

TRAVIS (R. V.) & BRIERLEY (P.). **Tobacco ringspot virus from Iris and Easter Lily.**—*Plant Dis. Reptr*, **41**, 6, p. 524, 1957.

A ring spot virus recovered at Beltsville, Maryland, from iris [**36**, p. 764] was shown to be a strain of tobacco ring spot virus. Another strain was found to occur without symptoms in Easter lily [*Lilium longiflorum* var. *eximium*]. The strains vary in severity on different indicator hosts.

WEBER (G. F.). **Vascular wilt of Mimosa in Florida.**—*Plant Dis. Reptr*, **41**, 7, pp. 640–642, 4 fig., 1957.

An isolated case of wilt disease (*Fusarium oxysporum* f. *perniciosum*) of mimosa (*Albizzia julibrissin*) [**36**, p. 587] is reported from Gainesville, Florida, 100 miles from previously reported cases in the State.

PETRESCU (M.). **Antracnoza puieților de Ligustrum vulgare L., produsă de ciuperca Glomerella cingulata (Stone) Spauld. et Schrenk.** [Anthracnose of the young plants of *Ligustrum vulgare* L. caused by the fungus *Glomerella cingulata* (Stone) Spauld. & Schrenk.]—*Bul. ști. Acad. Repub. rom.*, **8**, 4, pp. 755–768, 11 fig., 1956. [Russian and French summaries.]

G. cingulata causes serious damage to young privet plants [**36**, p. 699] in Romania. Good control was obtained by treating the soil with 1% formalin 8–10 days before sowing, disinfecting the seeds for 5 min. in the same solution, and spraying the seedlings with Bordeaux mixture.

VON ARX (J. A.). **Schurft op Pyracantha.** [Scab on *Pyracantha*.]—*Tijdschr. PlZiekt.*, **63**, 4, pp. 198–199, 1 fig., 1957. [English summary.]

At the Phytopathologisch Laboratorium 'Willie Commelin Scholten', Baarn, no perithecia of *Spilocaea pyracanthae* (Otth) von Arx comb. nov. (*Fusicladium pirinum* var. *pyracanthae*) [**32**, p. 484] were found on overwintered fallen infected leaves of *Pyracantha coccinea* during 3 years. The fungus overwintered in the conidial stage on living leaves and twigs.

TIMMERMANS (A.). **Aantasting van bladeren van Rhododendron door Chaetapiospora rhododendri (Tengw.) v. Arx.** [Attack of Rhododendron leaves by *Chaetapiospora rhododendri* (Tengw.) v. Arx.]—*Tijdschr. PlZiekt.*, **63**, 4, pp. 191–192, 1957. [English summary.]

At the Phytopathologisch Laboratorium 'Willie Commelin Scholten', Baarn, *C. rhododendri*, isolated together with *Botryosphaeria foliorum* from dead and discoloured patches on rhododendron leaves, was examined for its infectivity on old and young rhododendron leaves under various conditions. It was concluded that *C. rhododendri* is exclusively a wound parasite, rapidly spreading in and killing old leaves, but limited in its spread in young ones.

KIRBY (R. S.). **Systox-lead arsenate, antibiotics, and sulfur in the control of powdery mildew on Roses.**—*Plant Dis. Reptr*, **41**, 6, pp. 534–535, 1957.

At Pennsylvania State University control of powdery mildew (*Sphaerotheca*

[*pannosa*]) [**35**, p. 825] on roses with a systox-lead arsenate combination (12 oz.: 2 lb.: 100 gal.) was greatly superior to that with sulphur-ferbam, griseofulvin, and anisomycin, the average resultant infection in Sept. being 0·11, 7·4, 9·8, and 11·7%, respectively.

ARK (P. A.) & SIBRAY (W. S.). **Efforts to control crown gall of Roses with antibiotics.**—*Plant Dis. Reptr*, **41**, 5, pp. 449–451, 1957.

Agrobacterium tumefaciens, which causes serious damage in many rose nurseries in California [**35**, p. 284], was significantly controlled (89·1%) in Manetti cuttings by a 2-hour dip in 500 p.p.m. streptomycin. Dust treatments (1,000 and 2,000 p.p.m.) were not satisfactory. Tetracycline (100 p.p.m.) dips gave 67% control in Manetti and 40% in Paul's Scarlet, the last being the most susceptible, while Burr Multiflora is the most resistant.

RAMSFJELL (T.). **Virussjukdommer på frukttræer.** [Virus diseases of fruit trees.]—*Frukt og Bær, 1957*, pp. 64–76, 19 fig., 1957. [English summary.]

This is a semi-popular survey of the viruses and virus-like disorders of fruit trees (*a*) observed and (*b*) likely to be encountered in Norway. The former group [**30**, p. 167] includes rough skin of apple, ring mosaic of pear, which chiefly affects Nouveau Poiteau [cf. **35**, p. 831] and has been transmitted by grafting to *Sorbus hybrida*, and plum line pattern and (?) bark split [cf. **35**, p. 875].

BYRDE (R. J. W.), CLARKE (G. M.), & HARPER (C. W.). **Spraying experiments against Apple scab at Long Ashton, 1956.**—*Rep. agric. hort. Res. Sta. Bristol, 1956*, pp. 103–108, [1957].

In this final year of a 3-year trial, scab (*Venturia inaequalis*) [**35**, p. 900] infection was very low after post-blossom applications (of which details are given) of either captan (0·075%) or lime-sulphur (0·75%), in conjunction with a single pre-blossom application of lime-sulphur. There were indications of a heavier crop and, on type IX, of less fruit russet following the use of captan. A high level of mildew (*Podosphaera leucotricha*) was recorded on shoots of the current season following captan, but the economic importance of this may have been small.

RICH (A. E.). **Effect of various fungicides applied during bloom on Apple pollination and fruit set.**—*Agric. Chemic.*, **12**, 6, pp. 64–66, 1957.

At the New Hampshire Agricultural Experiment Station a number of fungicides used against apple scab [*Venturia inaequalis*] were examined for their capacity to prevent fruit set when applied during blossoming. Tests in which pollen was observed in dilute sucrose solution in the presence of the fungicides suggested that all except sulphur would be unsafe for use. However, in field trials captan, dichlone, ferbam, glyodin, and sulphur did not seriously reduce pollen germination or fruit set.

HAMILTON (J. M.) & SZKOLNIK (M.). **Performance of omadine, AC 5223, and other promising fungicides in the control of Apple scab and cedar-apple rust.**—*Plant Dis. Reptr*, **41**, 4, pp. 293–300, 1957.

Fungicide trials against apple scab (*Venturia inaequalis*) and cedar-apple rust (*Gymnosporangium juniperi-virginianae*) [cf. **36**, pp. 192, 453] are reported from the New York State Agricultural Experiment Station, Geneva. The iron salt of omadine proved more effective than the other omadine salts; AC 5223 was the most promising among the guanidine base fungicides; the puratized compounds and the thiram fungicides thioneb and thylate showed variable effectiveness against scab, but thioneb was not as specific against the rust as ferbam. None of these new organic fungicides, however, gives effective control of powdery mildew (*Podosphaera leucotricha*) [cf. **36**, p. 597].

Marsh (R. W.) & Edney (K. L.). **Spraying trials at Long Ashton 1953–1956 for the control of Gloeosporium storage rot in Allington Pippins.**—*Rep. agric. hort. Res. Sta. Bristol, 1956*, pp. 109–115, 1 graph, [1957].

Following a 4-year trial at Long Ashton, of which details are given, and in which Allington Pippins were sprayed in mid-Aug. and mid-Sept. with 0·1% captan, it was concluded that this treatment consistently reduced the incidence of storage rot (*Gloeosporium* [*Neofabraea*] *perennans* and *G. album*) during cold storage [cf. **36**, p. 193]. An additional spray in July 1956 further improved the control, which also appeared to benefit markedly from the grassing-down of the orchard in the spring of 1955.

Woodhead (C. E.). **Collar rot and root rot of Cox's Orange Pippin and other Apple varieties.**—*Orchard, N.Z.*, **30**, 6, pp. 16–17, 19, 21, 4 figs.; 7, pp. 2, 5, 7, 9, 1957.

In a survey during 1955–6 of collar rot (*Phytophthora cactorum*) [**35**, p. 685] on Cox's Orange Pippin and other apple varieties in Nelson and Marlborough, New Zealand, an increase in incidence was recorded from 0·2% in trees of 5 years or less to 17·7% in those of over 40 years. Collar rot in 6,095 top-worked trees was only 25% of that in the single-worked. Incidence of root rot in single-worked Cox trees was much lower than collar rot, spread of infection downwards into the rootstock being rare.

Trees top-worked on Dunn's Favourite and Statesman were highly resistant to collar rot, with 2·3 and 1·7% infection, respectively, compared with 12·1% on single-worked Cox of the same age.

Defective drainage seems to be a dominant factor in increasing the disease. Recommendations for the treatment of existing orchards are as follows: improvement of drainage, especially on clay land, removing grass and weeds around the trees in autumn, and preventing contact of Cox wood with the soil by ensuring that the bud unions are not buried, at the same time avoiding any depression in the ground around the tree trunk. New orchards should be planted so that no Cox wood is closer to the ground than 30–36 in. Resistant vars. such as Dunn's Favourite and Statesman may be planted and after a year or two reworked to Cox, or Cox may be grafted on unworked rootstocks when suitably branched.

Hamilton (J. M.) & Szkolnik (M.). **Omadine, a promising new organic fungicide for the control of blossom blight of Pears.**—*Plant Dis. Reptr*, **41**, 4, pp. 301–302, 1957.

In greenhouse tests at the New York State Agricultural Experiment Station, Geneva, for control of blossom blight (*Erwinia amylovora*) of pear [**35**, p. 379], more effective control was obtained with omadine OM 1456 and OM 1563, the sodium and zinc salts of 2 pyridinethione 1-oxide, than with a number of other antibiotics or Bordeaux mixture.

Woodbridge (C. G.), Blodgett (E. C.), & Diener (T. O.). **Pear decline in the Pacific northwest.**—*Plant Dis. Reptr*, **41**, 7, pp. 569–572, 4 fig., 1957.

Two forms of pear decline [cf. **29**, p. 587] have become of economic importance in Washington and British Columbia in recent years. The cause is still unknown. Quick decline, the less prevalent, has been seen on Bartlett, Anjou, Bosc, Winter Nelis, and sometimes on Flemish Beauty. Generally mature trees are involved, the leaves wilt, as a rule shortly before harvest, young wood shrivels, fruit becomes soft, and the trees do not recover. Distribution in a field is of varying pattern.

Slow decline, starting with lessened terminal growth, develops over a period of years, and may affect over 50% of the trees in an orchard. In advanced stages little growth is made, leaves are small, and die-back may occur. Japanese rootstock, *Pyrus serotina*, may be an associated factor. Bartlett is most commonly affected, but Anjou, Winter Nelis, and Bosc also suffer, though rarely Flemish Beauty.

List (G. M.), Landblom (Nellie), & Sisson (M. A.). **A study of records from the Colorado Peach mosaic suppression program.**—*Tech. Bull. Colo. agric. Exp. Sta.* 59, 28 pp., 1956.

Of the peach trees examined during 21 years in Mesa county, Colorado, 125,100 were infected by peach mosaic virus [**35**, p. 618], 36·5% of these being found and removed in the first 2 years. During the last 17 years there was no significant reduction in the total annual number of current infections, which were found in 75·1% of all orchards in which the disease had already been recorded and in 35·2% of those without immediately previous infection, the percentage of currently infected trees in the former group being 10 times that in the latter. Infected trees per 1,000 inspected during the first 3 years numbered 35·7, for the whole period 9·5, and 6·5 for the last 17 years.

Incidence increased considerably in orchards containing tolerant varieties compared with those having only non-tolerant. This suggests that tolerant trees should be eliminated, or each should carry a limb or two of a non-tolerant variety or be indexed annually by budding.

Geissman (T. A.). **The flavonoid constituents of normal and virus-infected Peach and Cherry leaves.**—*Arch. Biochem.*, **60**, 1, pp. 21–26, 1956.

At the University of California, Los Angeles, the examination, by a combination of paper-chromatographic and spectrophotometric methods, of normal peach and cherry leaves and comparable material infected by western X [peach western X disease virus] and cherry [necrotic] rusty mottle virus [**33**, p. 611; **35**, p. 689], respectively, revealed glycosides of kampferol and quercetin and esters of *p*-coumaric and caffeic acids in the former host and *p*-coumaric acid in the latter (after alkaline hydrolysis of an extract).

Normal and diseased foliage showed qualitative similarity, but the former contained less of all and very much less of some constituents than the latter. For instance, infected cherry leaves contained, per unit of dry weight, about 3 times as much kampferol and quercetin and nearly twice as much caffeic acid as normal ones.

Kearns (H. G. H.) & Martin (J. T.). **Spray application problems: XXXV. The control of leaf spot disease (Mycosphaerella musicola) on Lacatan Bananas. The levels and distribution of Bordeaux mixture deposits.**—*Rep. agric. hort. Res. Sta. Bristol, 1956*, pp. 135–141, 4 fig., [1957].

A variety of treatments with Bordeaux mixture (using various strengths and types of equipment, with and without wetters) in Jamaica were compared with respect to the cover achieved on the under surface of the 1st 2 leaves of Lacatan bananas, now replacing Gros Michel [cf. **26**, p. 250, *et passim*]. The leaves were removed and sprayed on the ground with $\frac{1}{5}$ pint/leaf, equivalent to 40 gal./acre on the 3 top leaves in the field (6 times the vol. the leaves can retain), and after drying, 10×5 in. samples were taken for assay at Long Ashton. In the absence of a wetter a fine mist containing 0·2% Cu gave deposits of the same order (2·5 μg./sq. cm.) as did a drenching at the same concentration. The deposit obtained by full coverage spray with a non-ionic wetter (at 0·025%) was much greater (7·9 μg./sq. cm.) and more evenly distributed. At 0·05% Cu (wetter at 0·025%), the average deposits (2·2 and 2·1 μg./sq. cm.) were approximately equal to those obtained with mist or drenching applications at 0·2% Cu without wetter, and better distributed.

Of the commercially available wetters sodium dinonyl sulphosuccinate and a non-ionic alkyl aryl polyether alcohol proved the best. At 0·0125–0·025% the succinate gave immediate wetting and spreading at the leaf surface, and satisfactory cover with cuprous oxide, copper carbonate, and copper oxychloride, but being an ionic material it could not be used with Bordeaux. The non-ionic wetter, compatible

with Bordeaux, gave optimum wetting at 0·04% and reasonably satisfactory wetting at 0·025%, though not as effective as the succinate. To control ascospore infection only the young unfolded leaves need be sprayed, but they are difficult to wet. The performance of hydraulic nozzles had little influence compared with the physical properties of the spray fluid.

PONT (W.). **Progress in Banana leaf spot control in North Queensland.**—*Qd agric. J.*, **83**, 6, pp. 317–326, 6 fig., 1957.

Applied under high pressure at high volume as protectants against *Cercospora musae* [*Mycosphaerella musicola*: **35**, p. 877], copper oxychloride and the same with wettable sulphur were equally efficient, and copper fungicides generally better than organic. Regular spraying of the heart leaves, especially during late summer and autumn, with at most 4 weeks between applications, brought the disease under control. As a suppressive fungicide, Bordeaux mixture (3:2:40) plus white oil (1:160) plus malachite green (1:10,000) proved superior to Bordeaux with other admixtures. Low-volume misting and fogging with oil-based copper oxychloride was more expensive than spraying, but quicker (1 acre misted in 1 hr.).

LI (L.-Y.). **A virus disease of Longan, Euphoria longana, in Southeast China.**—*Acta phytopath. sinica*, **1**, 2, pp. 211–216, 1 pl., 1955. [Chinese. Abs. from English summary. Received 1957.]

A virus disease of *E. longana* first noticed in 1948 causes narrowing and crinkling of the young leaves, which fall prematurely, while shoots developing at the base of the affected twigs soon resemble a broom. Fruit production is affected, the flowers being crowded and deformed and dropping early. At the Fukien Agricultural College the virus was transmitted by grafting, inarching, and air layering as well as in seeds from diseased trees. It was also transmitted by grafting to *Litchi chinensis*.

WENG (S.-T.), YU (C.-Y.), CHAO (S.-Y.), TSE (T.-S.), & CHANG (H.-S.). **Studies on angular leaf spot of Diospyros kaki and Diospyros lotus.**—*Acta phytopath. sinica*, **2**, 1, pp. 67–80, 2 pl., 1 fig., 1 graph, 1956. [Chinese. Abs. from English summary. Received 1957.]

Cercospora kaki is prevalent on persimmon (*D. kaki*) [cf. **35**, p. 623] in the Hopei province of China where, after losing their leaves and fruits due to infection, the plants are predisposed to cold injury. The same fungus attacks *D. lotus* (wild persimmon), which appears to be more resistant than *D. kaki* in arid regions, while the reverse is true in humid or irrigated regions. The fungus is disseminated chiefly by water or rainfall and not by wind. Removal of the infected calyces, which tend to persist, may control the disease on *D. kaki*. Two applications of Bordeaux (1:2:320) before August were also effective, particularly on *D. lotus* in irrigated areas where removal of the more numerous calyces is impracticable.

COHEN (U.) & MULLER (A. S.). **New host records for Elsinoe lepagei Bitanc. & Jenkins.**—*Plant Dis. Reptr*, **41**, 6, p. 540, 1957.

E. lepagei [**21**, p. 225] has been recorded on *Pouteria campechiana* in Florida, and on sapodilla (*Achras sapota*) in Florida and Cuba, in each instance on nursery plants.

RØED (H.). **Parasitære vinterskader på engvekster og hostsæd i Norge.** [Parasitic winter injury on pasture crops and autumn-sown cereals in Norway.]—*Nord. JordbrForskn.*, **38**, pp. 428–432, 1956. [Received Oct. 1957.]

Although rye is the principal host of *Fusarium nivale* [*Calonectria nivalis*] and other *F.* spp. in Norway [**2**, p. 202], as in the other Scandinavian countries, these fungi have frequently been observed on wheat during recent tours of inspection, especially

in the east, and may be responsible for heavy damage to that crop, as well as to various grasses, e.g., timothy [*Phleum pratense*] and *Agrostis tenuis*.

Sclerotinia borealis [**32**, p. 383] is fairly prevalent on *P. pratense* and other grasses, e.g., *Dactylis glomerata*, principally in the mountainous districts of the east, though it also occurs at high altitudes round Tröndelag and as far north as Tromsö. Since the first detection of the fungus in Norway in 1922 it was not observed on winter cereals until 1956, when the wheat crop round Mjösa was decimated.

S. trifoliorum [loc. cit.] is the most destructive of all the fungi concerned in winter injury in both southern and eastern regions, affecting not only red but also white and alsike clovers and lucerne; it was also found once on *Lupinus polyphyllus*.

Particulars are given of the distribution of *Typhula itoana*, *T. borealis* [loc. cit.], and *T. hyperborea* [**34**, p. 634]. The first-named is widespread on wheat, rye, *P. pratense*, and a number of other pasture and lawn grasses but seldom causes appreciable damage. *T. borealis* is a much more important pathogen of wheat, *P. pratense*, and other grasses; it may also ruin lucerne and severely damage clover crops, besides being associated with winter injury to young spruce trees. *T. trifolii* [**30**, p. 614] has not been found causing winter injury to clover in Norway, though its sclerotia occur fairly frequently in seed, especially from the eastern areas.

Cormack (M. W.). **Effect of environmental factors on development of snow mold.**—*Proc. Canad. phytopath. Soc.*, **24**, p. 19, 1956.

At the Science Service Laboratory, Lethbridge, Alberta, snow mould infection was produced on lucerne, grasses, and winter wheat by inoculation of plants previously conditioned for 1 week to artificial light at 5° C. The low temperature basidiomycete [unspecified: **36**, p. 32] that causes most of the damage in W. Canada required a temperature near freezing (2–4°) for the infection period of 6–8 weeks. High R.H. (90–95%) favoured infection, but saturation of soil or atmosphere was deleterious. Freezing temperatures and a snow cover were not necessary, but coverage of some kind, as by a closed cabinet, was required. The temperature and moisture requirements for infection by *Typhula* spp. and *Sclerotinia borealis* have not yet been accurately determined [cf. **35**, p. 192].

Gould (C. J.). **Turf diseases in Western Washington in 1955 and 1956.**—*Plant Dis. Reptr*, **41**, 4, pp. 344–347, 1957.

At the Western Washington Experiment Station, Puyallup, *Fusarium* patch (*F. nivale*) [*Calonectria nivalis*: **35**, p. 380] was found to be the most serious turf disease of the greens on 8 of the 10 golf courses surveyed in 1955 and on 16 of the 17 surveyed in 1956, red thread (*Corticium fuciforme*) [**35**, p. 192] being the most serious on the other 3. The latter was a slow invader but, once established, was more destructive and less subject to climatic conditions than *Calonectria nivalis*. On turf other than greens fairy ring (primarily *Marasmius oreades*) [cf. **35**, p. 680] was the most troublesome disease, followed by *Corticium fuciforme*.

Sill (W. H.) & Pickett (R. C.). **A new virus disease of Switchgrass, Panicum virgatum L.**—*Plant Dis. Reptr*, **41**, 4, pp. 241–249, 4 fig., 1957.

This is an expanded account of a *Panicum* mosaic virus disease on *P. virgatum* already noticed [**36**, p. 409]. Immune and susceptible test hosts are tabulated. *P. miliaceum* and *Setaria italica* were highly susceptible.

Busch (L. V.). **Investigations of the physiological predisposition of Red Clover plants to root and crown rot.**—Abs. in *Proc. Canad. phytopath. Soc.*, **24**, p. 18, 1956.

Field observations of red clover affected with root and crown rot [cf. **34**, p. 39; **35**,

p. 192] at the Ontario Agricultural College, Guelph, showed that these rots did not appear until the plants entered the reproductive phase and that they were more severe in fields deficient in K or P, or both. Plants raised in the laboratory at 18-hr. photoperiod, which induces strong reproductive activity, frequently exhibited root rot symptoms similar to those seen in the field, while vegetative plants receiving a 12-hr. day rarely exhibited any. Field symptoms were reproducible in the light chamber by inoculating plants deficient in P and K and receiving an 18-hr. day, but not in comparable plants receiving either high P and K or high K.

Annual Report of the Department of Hop Research, Wye College, 1956.—100 pp., 1957.

In his review of research (pp. 5–10) H. S. Darling outlines the work done during 1956 on the breeding of hop varieties for resistance to wilt (*Verticillium albo-atrum*) [cf. **36**, p. 498]. Only one variety (CC77) with field resistance to downy mildew (*Pseudoperonospora humuli*) showed commercial promise. Copper deposits from a range of commercial treatments (including high- and low-volume spraying) varied from 1 to 27 μg. Cu/sq. cm. of leaf surface. It is also stated (pp. 11–13) that the discovery of a single *Verticillium*-wilt infected hill in the Nursery Garden, hitherto unaffected, indicates that the disease may not have been eradicated. Two isolated hop quarantine gardens have been established at Boxworth, Cambridge. In the plant breeding section (pp. 16–20), R. A. Neve & R. F. Farrar state that 40 varieties remain in the scheme for the production of hops tolerant of *V. albo-atrum*. From 14 of these will be made the first selections for the 1960 farm trials.

Reviewing the year's work on plant pathology (pp. 36–43), H. S. Darling & Dorothy M. Derbyshire describe a repetition of an earlier spraying trial against downy mildew with the Petham Golding variety. The results again indicated that captan was as effective as copper fungicides in controlling the spike form of the disease, but other trials showed that it should not be used to protect ripening cones, such as those of Goldings, intended for dry-hopping. Such hops should not be sprayed with captan after mid-Aug., and in general the application of captan to ripening hops is inadvisable. In testing for resistance to downy mildew a detached leaf technique [see below] enabled comparison to be made of different varieties. Leaves at 4 stages of development were placed in moist Petri dishes, sprayed with a suspension of sporangia from which the motile zoospores had been liberated, and after incubation at room temperature examined for sporulating sporangiophores. Leaves from Dr. Zattler at Munich displayed high resistance to *P. humuli*. Some rooted lateral cuttings of seedlings and commercial varieties produced cones which were inoculated; after incubation the differences in the number of sporangiophores on cones of susceptible and resistant varieties suggested this method as suitable for the selection of plants for breeding.

F. C. Thompson (pp. 50–53) reports a sand-culture experiment with Fuggle N which showed that increased nickel content of the plants did not cause nettlehead [cf. **35**, p. 875], as had been suggested, but only chlorosis and leaf scorch due to mineral toxicity.

F. H. Beard (pp. 55–64) gives an account of the incidence of downy mildew in 77 new hop seedling varieties at Wye during 1950–56 [cf. **17**, p. 203; **32**, p. 277]. The various forms the disease takes are described. Thus, when growth starts in the spring, affected buds fail to develop normally, and produce stunted, yellowish shoots, known as 'basal spikes'. In May the leaves may become infected, interveinal, pale, later brown, angular spots developing and sporulating on the under surface; young lateral shoots may also be infected, and the growing tip of the bine may become diseased in May or June. If spraying has been inadequate the cones may be attacked in Aug. and Sept. and the entire crop lost. In some varieties, the bases of the past season's bines (known as 'straps') and also the rootstocks may

rot and die during the dormant season. Summer rainfall alone does not appear to play a consistent part in spread. A wide range of varietal susceptibility was found; in the most resistant seedling, CC77, the incidence of diseased shoots (spikes) of all types averaged only 4/year/100 hills, whereas in the most susceptible seedling, Wye Field Golding, the figure was 1,518. No correlation could be established between susceptibility to the spike form of the disease and attack in the rootstock. The 77 varieties include derivatives of Wild Hop, Manitoba, New Mexican wild hop, and Oregon Cluster, and the data indicate that varieties derived from the New Mexican hop are conspicuously free from rootstock infection; at East Malling, 35 varieties were all unaffected, while at Wye, of 12 varieties only one third-generation seedling was lightly affected.

F. H. Beard & Dorothy M. Derbyshire (pp. 65–72) describe a survey of 900 hills grubbed in the winter of 1956–7. Nearly 75% of the rootstocks (none more than 8 years old) were rotted and *P. humuli*, unchecked by control practices on the aerial parts of the plant, was present in the rest of the hills. The extent of its responsibility for the rot is to be investigated and the effect of dusting the hills with Bordeaux powder or captan, either at the beginning of the season or throughout the growing period, is to be observed.

Dorothy M. Derbyshire & Evelyn M. Dixon (pp. 73–76) describe the growing of hops under glass throughout the winter of 1956–7 to provide young leaves for inoculation with *P. humuli*. The use of a heated glasshouse 16 × 10 ft. with lighting to extend the winter day length to 13–16 hr. gave the necessary succession of young foliage for resistance tests.

Sackston (W. E.), McDonald (W. C.), & Martens (J.). **Leaf mottle or Verticillium wilt of Sunflower.**—*Plant Dis. Reptr*, **41**, 4, pp. 337–343, 3 fig., 1957.

In this account of leaf mottle (*V. albo-atrum*), from Science Service, Winnipeg, it is noted that the disease was first recognized in Manitoba in 1948 and had become destructive by 1954, reducing seed yield by 50%. Interveinal chlorosis, which mottles the leaves, is followed by necrosis. The symptoms appear first on the lower leaves and then progress upwards and the disease is typically scattered in the field. Premature ripening with death and consequent reduced yield of seed occurs when plants are severely attacked. The causal organism is soil-borne and can survive several successive grain crops to attack sunflower again. A similar *Verticillium* wilt of sunflower has been observed in Russia [**22**, p. 111].

Prendergast (A. G.). **Observations on the epidemiology of vascular wilt disease of the Oil Palm (Elaeis guineensis, Jacq.).**—*J. W. Afr. Inst. Oil Palm Res.*, **2**, 6, pp. 148–175, 5 pl. (1 col.), 4 diag., 1 graph, 1957.

The symptoms, incidence, and effect of fertilizer trials on the vascular wilt disease of oil palms caused by *Fusarium oxysporum* [**30**, p. 156] are described from observations on the Calabar Oil Palm Estate, Nigeria, and the Ndian Oil Palm Estate, Cameroons, where the disease has not reached economic importance, and the Cowan Oil Palm Estate near Sapele, Nigeria, where it has, owing possibly to a higher mean temperature, a fluctuating water table, and a poor soil status. A chronic and an acute form are distinguished. Two other species of oil palm, *E. melanococca* and *E. madagascariensis*, were also found to be affected

The disease has hitherto had little effect on over-all yields as unaffected palms responded rapidly to the progressive thinning which it brought about. Vascular wilt was significantly less in areas which had received adequate applications of potassium, indicating a possible means of control, combined with resistance, which must be sought. New infections tended to be more frequent adjacent to existing ones, and severe wilt occurred in young palms replanted in old wilt sites.

Bercks (R.). **Feldversuche über die Ausbreitung des Kartoffel-X-Virus.** [Field tests on the spread of Potato virus X.]—*Züchter*, **26**, 4–5, pp. 155–157, 1956.

From the Biologische Bundesanstalt für Land- und Forstwirtschaft, Institut für Virusserologie, Brunswick, are reported the results of experiments during 1953–4 on plots in different districts, to measure the rate of spread of potato virus X.

Infected tubers were planted at regular intervals among healthy ones, and at the end of the season the tubers from each of the 8 plants surrounding the infected one were examined for infection after sprouting in the dark [**31**, p. 543]. Each plot was divided, one-half being subjected to the usual cultural procedures and the other left untouched after emergence. The marked differences between the plots in respect of the spread of virus are discussed in terms of the effect of wind and cultivation. The highest rate of spread (52%) was recorded from a worked plot.

Hodgson (W. A.). **Studies on the nutritional requirements of Phytophthora infestans (Mont.) de Bary.**—Abs. in *Proc. Canad. phytopath. Soc.*, **24**, p. 20, 1956.

At the Plant Pathology Laboratory, Fredericton, New Brunswick, a synthetic medium has been developed which supports good growth of races 1,2 and 1,2,3 of *P. infestans*, but little or no growth of races 0 and 1. The inability of 0 and 1 to grow was not due solely to the requirement of a nitrogen source other than asparagine or to a deficiency of any of 20 amino acids: ascorbic acid stimulated their growth but 11 other vitamins did not. For races 1,2 and 1,2,3 asparagine was markedly superior to ammonium and nitrate salts as a nitrogen source, but their utilization of amino acids differed [cf. **36**, p. 548].

Wallin (J. R.). **Response of Potatoes to monozoospore lines of Phytophthora infestans.**—*Plant Dis. Reptr*, **41**, 7, pp. 612–615, 1957.

Zoospores of *P. infestans* were isolated by transferring sporangia from 14-day cultures on peas to water at 59° F., streaking the zoospores, when they appeared, on plain agar, and transferring single germinating zoospores to soybean meal dextrose agar and incubating for a fortnight at 59°, with subsequent transfer to peas. Differences in pathogenicity [cf. **32**, p. 586; **35**, p. 217] and sporulation were noted among 19 zoospore lines from 2 cultures and these are described.

Hyre (R. A.) & Wilson (J. D.). **The relation of rainfall and temperature to late blight of Potato in Northern Ohio.**—*Plant Dis. Reptr*, **41**, 7, pp. 616–619, 2 graphs, 1957.

The moving graph method of forecasting potato blight (*Phytophthora infestans*) [**35**, p. 318; cf. **36**, p. 493 *et passim*] proved less accurate in northern Ohio than on the upper Atlantic coast in years of little or no blight.

Lin (C.-K.), Hwang (H.), Wang (K.-T.), Hwo (S.-H.), & Wang (T.-P.). **Field observations on the epiphytology and experiments on the control of Potato late blight.**—*Acta phytopath. sinica*, **1**, 1, pp. 31–44, 2 fig., 2 graphs, 1955. [Chinese. Abs. from English summary. Received 1957.]

Under Chahar (China) conditions the incubation period for each secondary infection of potatoes by blight [*Phytophthora infestans*: **24**, p. 31] is constant (4 days) during the epiphytotic season. The interval between the initial appearance of infection centres and total field infection is 18–42 days, largely depending on rainfall. Lesion counts in the early period of disease spread showed that the distribution of secondary infection depends on the direction of the prevailing wind, 90% of the spores falling within a rectangle of 800 sq. m. around a diseased plant.

Two or 3 sprays with 0·1–0·2% copper sulphate at 7–10-day intervals, starting soon after the appearance of infection centres, gave remarkable control and reduced yield loss.

Tupenevich (S. M.). Подавление паразитической активности у гриба **Rhizoctonia solani Kühn.** как возбудителя черной парши Картофеля. [Suppression of the parasitic activity of the fungus *Rhizoctonia solani* Kühn. as the causal agent of black scurf of Potato.]—*Trud. vsesoyuz. Inst. Zashch. Rast.*, **5**, pp. 5–16, 1954. [Received 1957.]

In experiments in the U.S.S.R. black scurf of potatoes (*R.* [*Corticium*] *solani*) [**35**, p. 38, 219] was successfully controlled by planting after winter wheat. Vernalization of tubers in the light reduced the susceptibility of the young shoots. The early removal of the haulms and weed control are also important.

Haritonova (Mme Z. M.). Опыт борьбы с отпотеванием и болезнями клубней Картофеля при хранении путем укрытия его столовой Свёклой. [An experiment on the control of transpiration and diseases of Potatoes in storage by means of covering them with table Beet.]—*Trud. vsesoyuz. Inst. Zashch. Rast.*, **5**, pp. 139–143, 1954. [Received 1957.]

A 25–30 cm. layer of table beets stored over potatoes in clamps in the U.S.S.R. in 1951 and 1952 reduced the transpiration of the tubers and losses caused by scab [*Streptomyces scabies*: **35**, p. 219], *Rhizoctonia* [*Corticium solani*], *Phytophthora* [? *infestans*: **36**, p. 336], and dry rot [*Fusarium caeruleum*]. Disease incidence among beets in the clamps was only 1–1·5% higher than in those stored in boxes; the diseases included *Sclerotinia* sp., tail rot [cf. **19**, p. 183], and heart rot and dry rot. If more than 8–10% of the roots are diseased they should be removed and sorted.

Storage of the beets should not exceed 4–5 months.

Wright (N. S.). **Blue spotting of Potato tubers in British Columbia.**—*Plant Dis. Reptr*, **41**, 7, pp. 608–611, 2 fig., 1957.

Blue spotting disease of potato tubers [cf. **15**, p. 526] has been identified in late crop tubers, generally when soil moisture was inadequate during the latter part of the 1956 growing season. References to similar physiological disorders of potatoes in Great Britain, Holland, and the eastern United States are reviewed.

Sy (C.-M.). **Studies on the control of black rot (Ophiostoma fimbriatum) of Sweet Potato.**—*Acta phytopath. sinica*, **2**, 1, pp. 81–95, 1956. [Chinese. Abs. from English summary. Received 1957.]

Ophiostoma fimbriatum [*Ceratocystis fimbriata*: **35**, p. 636] on sweet potato, introduced into China from Japan in 1937, causes heavy losses. The fungus survived in the soil for 30 months after introduction and disappeared after 35 months. Before bedding, selected roots should be treated in hot water (51–54° C.) for 11 min. to kill the surface spores and any mycelium beneath the skin.

Tomizawa (C.). **Influences of purine antagonists on the growth of the Rice blast fungus Piricularia oryzae.**—*Bull. nat. Inst. agric. Sci. Tokyo*, Ser. C., *1956*, 6, pp. 111–122, 1956. [Japanese, with English summary. Abs. in *Chem. Abstr.*, **51**, 11, col. 8203, 1957.]

The effect of purine antagonists on the growth of *P. oryzae* on a synthetic agar medium was investigated. Adenine at 0·5 micromole/ml. slightly stimulated the development of a wild strain. A mutant obtained by ultra-violet radiation required either adenine or hypoxanthine at 0·1 micromole/ml. The toxic effects of 2,6-diaminopurine and 8-azaguanine were competitively overcome by adenine, their mol. ratios to the last-named giving 50% inhibition being 0·4 and 4, respectively. Inhibitory actions of 2,6-diaminopurine and 8-azaguanine were observed at concentration ranges of 2^{-9}–2^{-16} and $1{\cdot}25 \times 2^{-8}$–$1{\cdot}25 \times 2^{-16}$ micromole/ml., respectively. Hypoxanthine also competed with 2,6-diaminopurine and 8-azaguanine, but was

appreciably less effective than adenine. Sporulation of the fungus was not prevented but hyphal growth was retarded by 2,6-diaminopurine and 8-azaguanine.

TSING (F.), MA (Y.-S.), TSAO (K.-M.), HAN (H.-H.), & LI (C.-T.). **Experiments on the control of Rice blast by organic mercurial dusts.**—*Acta phytopath. sinica*, **1**, 1, pp. 79–86, 1 graph, 1955. [Chinese. Abs. from English summary. Received 1957.]

In plot trials in China against rice blast [*Piricularia oryzae*: **35**, p. 636] mixtures of phenyl mercury acetate and hydrated lime (1:5) or ethyl mercury chloride and hydrated lime (1:15 or 1:20), applied as dusts, were much more effective than Bordeaux and caused no injury except for a few necrotic spots on the leaves. In the field 2–3 applications during the growing season resulted in yields 25–158% higher than the untreated.

LI (Y.-K.) & LIN (L.-T.). **Rice blast and its control.**—*Acta phytopath. sinica*, **1**, 2, pp. 141–154, 1955. [Chinese. Abs. from English summary. Received 1957.]

In Kwangtung Province, China, blast [*Piricularia oryzae*] attacks both early and late crops of rice. Proper application of fertilizers together with breeding and selection of resistant varieties are the only means of control. The addition of extra P with a low proportion of K may reduce the severity of outbreaks resulting from the application of N fertilizers.

AKAI (S.) & OKU (H.). **Effect of pentachlorphenol compounds upon the susceptibility of Rice plants to Helminthosporium leaf spot.**—*Forsch. PflKr, Kyoto*, **5**, 4, pp. 159–163, 3 fig., 1956. [Japanese. Abs. from English summary.]

Pentachlorophenol, sodium pentachlorophenate, and pentachlorophenoxyacetic acid were examined for their effect on the susceptibility of rice to *Helminthosporium* [*Cochliobolus miyabeanus*: **36**, p. 725] leaf spot in Japan. Seedlings growing in a 0·005% solution of the sodium salt were severely injured, while the other 2 compounds at the same rate caused almost no injury. Infection was considerably reduced when pentachlorophenol or pentachlorophenoxyacetic acid (each 50 p.p.m.) or sodium pentachlorophenate (25 p.p.m.) was added to the soil in pots, the sodium salt being the most effective, though slightly injurious.

TANAKA (H.). **On the influence of carbon sources upon the growth of Cochliobolus miyabeanus.**—*Forsch. PflKr., Kyoto*, **5**, 4, pp. 165–170, 1 fig., 4 graphs, 1956. [Japanese. Abs. from English summary.]

The growth of *C. miyabeanus* on Czapek agar incorporating various sources of carbon was best with maltose, followed, in descending order, by fructose, sucrose, galactose, glucose, xylose, and lactose. Growth increased with conc. of glucose within the range 1–5%, and the opt. temp. was 28° C.

LU (C.-T.) & LI (H.-Y.). **Studies on the infection of Rice kernel smut.**—*Acta phytopath. sinica*, **1**, 1, pp. 87–93, 1955. [Chinese. Abs. from English summary. Received 1957.]

In experiments in China, placing moistened chlamydospores of *Neovossia horrida* in a Petri dish with a limited supply of water, the dish cover being inked blue to ensure favourable light conditions, resulted in abundant germination and basidiospore production. Similar results were obtained when chlamydospores were applied to the surface of grain on a growing rice head enclosed in a paraffined paper bag. High percentages of infection in the field coincided with excessive applications of N fertilizer. Fluctuation in the amount of infection from year to year is probably determined by the duration of the high moisture period from heading to dough stage.

Lin (C.-K.). **Studies on the nature of light reaction in chlamydospore germination of Rice kernel smut.**—*Acta phytopath. sinica*, 1, 2, pp. 183–190, 1955. [Chinese. Abs. from English summary. Received 1957.]

Further studies on the light requirements for the germination of overwintered chlamydospores of *Neovossia horrida* showed that 4–6 hr. under a fluorescent lamp of 50-candle power, or 2 hr. in direct sunshine was sufficient to promote subsequent germination in darkness. The light reaction was not influenced by temperature and illumination of dry spores was not effective. The dormant period was lengthened by low temperature during storage.

To avoid exposure of chlamydospores and their consequent germination, disturbance of the soil, compost, and other possible carriers should be minimized before and after the heading period of rice, when the host is most susceptible.

Tasugi (H.) & Ikeno (S.). **Morphology, pathology, and pathogenicity of Cercospora oryzae, the causal fungus of narrow brown spot of Rice plant.**—*Bull. nat. Inst. agric. Sci. Tokyo*, Ser. C, *1956*, 6, pp. 167–178, 1956. [Abs. in *Chem. Abstr.*, **51**, 10, col. 7490 g, 1957.]

C. oryzae [**31**, p. 458 *et passim*] was found to grow best on potato and soy-bean agars, while conidial production was most abundant on rice straw decoction agar. Growth occurred at 6–33° C. and pH 2·8–9·3, with optima at 25–28° and 5·7–7·1. Treatment with water heated to 45° destroyed the conidia within 45 min. and to 48° within 10; under dry conditions they succumb at 80° within 1 hr., at 85° within 30 min., and at 90° within 10. Older leaves were more susceptible than young ones in inoculation tests.

Wei (C.-T.), Kung (H.), & Pan (R.-S.). **Seedling-rot of Rice in Kiangsu.**—*Acta phytopath. sinica*, 1, 2, pp. 127–140, 1 fig., 1955. [Chinese. Abs. from English summary. Received 1957.]

Seedling rot of early rice in N. Kiangsu, China, is primarily a physiological disorder, seedlings weakened by low temperature or poor aeration being readily attacked by *Achlya* and other Saprolegniaceous fungi [**30**, p. 341; **36**, p. 723]. Germinated seeds should be covered with charred rice chaff and irrigation reduced to a minimum necessary to keep the bed moist except at the onset of a cold spell, when temporary flooding is advisable.

Schexnayder (C. A.) & Abbott (E. V.). **Study during 1956 of the effects of stunting disease on yields of Cane and sugar in Louisiana.**—*Sug. Bull., N. Orleans*, **35**, 22, pp. 334–339, 1957.

From the fairly substantial increases in cane yields resulting from an 8-hr. treatment at 54° C. of seed cane of the former leading commercial varieties C.P. 28/19 (53·9%), C.P. 29/320 (27·7), C.P. 34/120 (42·8), and Co. 281 (55·5) in the latest experiments at U.S. Sugarcane Field Station, Houma [cf. **36**, pp. 62, 728], it appears obvious that ratoon stunting virus disease [see below] was involved in their decline. The fact that seed piece decay caused plant cane stand failure of Louisiana Purple despite treatment demonstrates the continuing importance of seed piece diseases, e.g., red rot [*Glomerella tucumanensis*] and root rot [? *Pythium* spp.], and the possibility that ratoon stunting favours the development of these pathogens by delaying germination of the seed cutting and establishment of independent new plants requires further investigation.

Among the current commercial varieties included in the tests, C.P. 36/105 and C.P. 43/47 showed the most marked responses to heat treatment, with yield increases of 49·3 and 81·8%, respectively. Yields of C.P. 44/101 were not increased by the treatment, but production from canes of this variety originally selected

as virus-free in 1953 has continued to be higher than that from material selected as diseased in 1950. Furthermore, canes of the latter group, heat-treated in 1953, yielded appreciably better in 1955 and 1956 than either the originally healthy or the originally diseased. These observations are considered to indicate that the superior productivity of heat-treated cane may be maintained over a period of years. Taking an average of 2 plant cane and 2 stubble crops, heat-treated C.P. 44/101 cane outyielded the untreated by 28%.

Among unreleased varieties now in the test fields, C.P. 53/1 proved to be very susceptible to ratoon stunting and C.P. 52/68 highly resistant, while the yields of C.P. 53/18 were reduced to about the same extent as those of C.P. 44/101.

STEIB (R. J.) & FORBES (I. L.). **Johnson Grass and Corn as carriers of the virus of ratoon stunting disease of Sugarcane.**—*Sug. Bull., N. Orleans*, **35**, 23, pp. 375, 379, 1957.

In Nov. 1956, healthy seed pieces of C.P. 44/101 sugarcane were inoculated with the expressed sap of maize plants that had been inoculated 3 times with ratoon stunting virus from sugarcane but had developed no symptoms. Of 10 plants from these seed pieces examined on 4 May 1957, 7 were diseased, compared with none from the uninoculated and those inoculated with sap from healthy maize. On the other hand, all 10 plants from seed pieces inoculated with sap from infected cane were diseased.

On 31 July 1957, 25 of 26 C.P. 44/101 plants inoculated on 25 June 1956 with sap from Johnson grass [*Sorghum halepense*], inoculated in turn 3 months earlier with the virus through the rhizomes, were diseased, though the results of a previous test performed on 18 Dec. 1956 and inspected on the following 25 Feb. showed that sap from supposedly diseased *S. halepense* plants (with an orange-red nodal discoloration) and symptomless plants from the field did not induce symptoms in C.P. 44/101.

Since *S. halepense* may, therefore, under field conditions, act as a carrier of the virus, which may also be spread by implements from shoots produced by old rhizomes, treated seed cane and its progeny should be planted in areas free from *S. halepense*.

SHARMA (S. L.) & JHA (J. N.). **'Spike' (a new) disease of Sugarcane.**—*Proc. Indian Acad. Sci.*, **45**, 1, pp. 16–20, 3 pl., 1957.

From the Central Sugarcane Research Station, Pusa (Bihar), the authors describe a new disease of sugarcane which was first noted in South Bihar in late Aug. 1954, and was not uncommon there in Sept. and Dec. of the same year. In Sept. 1955 20 of 161 plots examined were affected. The diseased plants occur in patches, usually at the corners or edges of the fields, and within the patches the incidence may be as high as 75%. On diseased stalks both the leaves and internodes are stunted in varying degrees and sprouting of buds occurs in the affected region. Where the disturbance is mild or medium the stalks recover, growing on to produce progressively more normal leaves and internodes. When single-budded setts were taken from the bottom, middle, and top portions of mildly affected stalks growth from the bottom ones showed distinct signs of the malady, while that from the middle ones was retarded by comparison with that in the top ones. Thus it seems that the causal factor is present in the affected stalks but not evenly distributed.

It is proposed to name this condition 'spike disease' in view of the appearance of affected shoots.

BADRUDDOZA (K. M.). **Studies on the isolates of Physalospora tucumanensis Speg.**—*Diss. Abstr.*, **17**, 5, p. 954, 1957.

The author reports studies at the Louisiana State University, in which the cultural

and morphological characteristics and the pathogenicity of 3 light and 3 dark strains of *P.* [*Glomerella*] *tucumanensis* from sugarcane were compared.

JAYARANAN (V.) & VENKATARAMANI (K. S.). **Control of blister blight of Tea in Southern India—the 1956 field trials.**—*Plant Chron.*, **52**, 2, pp. 35–39, 1957.

Fungicide trials by the United Planters' Association of Southern India in the Nilgiris, in 1956, against blister blight [*Exobasidium vexans*: **36**, p. 131] showed that 50% Cu fungicides at 4 oz./10 gal. water were more effective than non-metallic preparations or wettable formulations of 8% Cu or less. Captan proved effective at 8 oz./10 gal. There was no significant difference between cuprous oxide and copper oxychloride preparations. Colloidal copper at 20% equalled the 50% Cu fungicide and at 15% showed promising results; fungicides with a reduced Cu content should be tested on a larger scale.

BRODA (E.). **Biochemie des Tabakmosaikvirus.** [Biochemistry of the Tobacco mosaic virus.]—*Öst. chem. Z.*, **58**, 7–8, pp. 85–112, 4 fig., 2 graphs, 1957.

Many of the contributions consulted for the author's useful summary of up-to-date information on the biological properties, chemical composition, and biogenesis of tobacco mosaic virus [cf. **36**, p. 66] and the functions of nucleic acid and protein in relation to its infectivity have already been noticed in this *Review.*

TROUTMAN (J. L.). **Resistance in Tobacco to Cucumber mosaic and other viruses.** —*Diss. Abstr.*, **17**, 5, pp. 944–945, 1957.

Disease escape is the only type of resistance to cucumber mosaic virus at present known in tobacco. In an investigation to evaluate it, at the University of Wisconsin, a series of plants were inoculated with strains which produce local necrotic lesions on the leaves [cf. **35**, p. 863]. The resistant plants developed a few spots only whereas susceptible plants developed many. There was a wide range of resistance between different varieties. No discrete classes of resistance were found in the progeny of resistant × susceptible crosses, the majority of F_1 and F_2 plants being intermediate between the parents. The spread of resistance in F_2 plants was greater than in F_1, indicating that a recombination of factors occurred. It was concluded that the responsible factors lacked dominance and were inherited after the manner of quantitative characters.

The slower and later development of lesions in resistant plants was not explicable in terms of the rate of multiplication of the virus, which was found to reach max. conc. in 4 days in both a resistant and a susceptible variety. Extracts from healthy susceptible and resistant leaves were equally inhibitory to the virus.

Placing resistant plants in the dark for 24 hr. before inoculation markedly increased their susceptibility, while in susceptible plants there was only a slight increase. In field trials in 1955 there was much less natural infection in an [unspecified] resistant variety than in a susceptible one. In 1956, under more severe conditions, both exhibited 100% infection by the end of the season, but the spread of infection was much slower in the resistant variety. There was no evidence that the aphid vectors preferred one to the other.

ANGELL (H. R.). **The relation of districts and of blue mould in seed beds to loss of Tobacco in fields in North Queensland.**—*J. Aust. Inst. agric. Sci.*, **23**, 2, pp. 144–148, 1957.

The varying damage to tobacco by blue mould [*Peronospora tabacina*: **36**, p. 427] in different areas of N. Queensland in 1956 arising from failure effectively to apply benzol [benzene] treatment in the seed-beds is described. Up to 65% loss of seedlings on some farms and an average 25% loss in some districts resulted.

BJØRNSTAD (A.). **Virus på Tomat.** [Tomato viruses.]—*Småskr. LandbrDep., Oslo,* 3, 8 pp., 8 fig., 1957.

Semi-popular notes are given on diseases of tomato in Norway caused by the following viruses: attenuated strains of tobacco mosaic virus, potato viruses X and Y, tomato spotted wilt, cucumber mosaic, tomato aspermy (rare on tomato but very prevalent on chrysanthemum [cf. **36**, p. 700]), and tobacco necrosis.

GRAAFLAND (W.), GADELLA (T. W. J.), & BRANTS (D. H.). **Het kweken van Tomate wortels besmet met Tabaksmosaiekvirus.** [Culture of Tomato roots infected with Tobacco mosaic virus.]—*Tijdschr. PlZiekt.,* **63**, 4, pp. 195–197, 1957. [English summary.]

At the Phytopathologisch Laboratorium 'Willie Commelin Scholten', Baarn, the authors have evolved a technique for the culture of tomato roots infected with tobacco mosaic virus. Seeds removed under sterile conditions from ripe tomato fruits are grown in tubes on 10 ml. agar incorporating White's solution [cf. **14**, p. 127]. The first-formed leaves are inoculated and when the virus reaches the roots, in 6 days, the infected roots are cut off and cultured in turn in White's solution. Direct inoculation of roots immediately before transfer to the solution was not satisfactory.

MACEDO (A. C.) & BAZÁN DE SEGURA (CONSUELO). **Comparativo de fungicidas para el control del Phytophthora infestans en el Tomate.** [A comparison of fungicides for the control of *Phytophthora infestans* on Tomato.]—*Bol. trim. Exp. agropec.,* **4**, 3, pp. 26–28, 1956.

Following field trials at La Molina, the author recommends parzate, manzate, and dithane D-78 (0·25% at 700 l./ha. every 10–15 days) for the control of *P. infestans* on tomato in the central coastal area of Peru. Bordeaux mixture did not give satisfactory protection.

WILSON (I. S.). **Growth cracks in Tomatoes.**—*Qd agric. J.,* **83**, 7, pp. 371–374, 2 fig., 1957.

Growth cracks are a common defect in commercial tomato crops in Queensland [cf. **36**, p. 517]. 'Radial' or 'star' cracks radiate from the corky tissue at the stem end; 'ring' or 'circular' cracks develop concentrically round the shoulders. In fruits severely affected by ring cracking, adjacent deep cracks may be united by smaller cracks; this gives a netted appearance to the skin.

Fruit cracking is due, fundamentally, to an unbalanced water relationship [cf. **26**, p. 319], and is usually associated with sharp variations in the moisture content of the soil as the fruit matures. Ring cracking is most marked in fruit grown almost to maturity in relatively dry conditions and then subjected to hot, wet weather. Tomatoes so placed in the fruit cluster that rain or dew lodges in the stem-end cavity may crack radially, the cracks following creases on the surface of the fruits immediately above the locules of the flesh. Nutritional upsets (e.g. boron deficiency) may also contribute to cracking.

In conditions favouring the disorder deep globe vars., such as Grosse Lisse, tend to develop ring crack before the flat-ribbed types, such as Rouge de Marmande. Radial cracking is generally more frequent on the ribbed types, though Marglobe and Rutgers may be severely affected. In conditions that favour cracking, no variety is immune. Cracks appear in all but very immature fruits and increase in severity as maturity advances. Radial cracking is most common on the lower fruit clusters, while in those which develop later it is more prevalent on the larger fruits nearest the stem.

Tomatoes on plants with abundant foliage are less liable to ring cracking than those exposed to dew or rain. Artificial shading reduced cracking and increased the

amount of high-quality fruit. The defect is also more severe on plants pruned to a single stem than on those left unpruned.

'Cuticle blotch' or 'shoulder blotch' is a form of skin cracking in which innumerable shallow circular cracks are arranged concentrically round the shoulders, near the stem end. Shrivelling of the skin causes these minute cracks to fuse, producing a discoloration It can occur after packing and may greatly reduce the commercial value of the fruit.

Denyer (W. B. G.) & Etheridge (D. E.). **A punch card for decay studies.**—*For. Chron.*, **32**, 4, pp. 429–432, 3 diag., 1956.

A description is given of a card combining a field sheet and a punch card used in the Prairie Provinces of Canada to record data of individual trees.

Fang (C.-T.), Yuen (S.-Y.), Lee (C.-T.), & Wang (K.-M.). **Experiments on the control of the stem rot disease of Ginkgo caused by Macrophomina phaseoli.** —*Acta phytopath. sinica*, **2**, 1, pp. 43–54, 1 graph, 1956. [Chinese. Abs. from English summary. Received 1957.]

M. phaseoli is one of the most troublesome pathogens of ginkgo and other forest trees in the nursery in China. The stem rot of ginkgo is favoured by hot, dry weather when the seedling tissues are injured by high soil temperatures, and an accurate forecast may be made from temperature and rainfall during June, July, and Aug. Shading and mulching of the seed-bed during the critical period controls the disease.

Krstić (M.). **Inhibiciona moć dva antibiotika prema nekim gljivama.** [Inhibitory property of two antibiotics against certain fungi.]—*Zasht. Bilja* (*PlantProt., Beograd*), *1956*, 37, pp. 3–6, 1956. [English summary. Received 1957.]

In experiments at the Plant Industry Station, Beltsville, Maryland, in 1954 and at the Institute for Scientific Researches in the Forestry of Serbia, Yugoslavia, in 1955 *p*-methoxy-tetrachlorophenol at 11–38 μg./ml. completely inhibited the growth of the following wood-destroying fungi: *Lenzites trabea*, *Stereum hirsutum*, *Lentinus lepideus* (all American isolates), *Lenzites saepiaria*, *Coriolus* [*Polystictus*] *versicolor* (both American and Yugoslav isolates), *Poria vaillantii*, *Trametes squaleus*, and *Schizophyllum commune* (all Yugoslav). The American isolates of *L. saepiaria* and *Polystictus versicolor* were somewhat more resistant than the Yugoslav. Of the fungi tested, *Phytophthora cinnamomi* (American) was the most resistant, tolerating the antibiotic up to 67 μg./ml.

Chiu (W.-F.), Yuen (C.-S.), & Wang (C.-K.). **Effect of insect control on the development of soft rot of Chinese Cabbage in the field.**—*Acta phytopath. sinica*, **1**, 1, pp. 71–78, 2 graphs, 1955. [Chinese. Abs. from English summary. Received 1957.]

In field trials at the Peking Institute of Agriculture, China, against *Erwinia aroideae* and *E. carotovora* [cf. **34**, p. 388] on Chinese cabbage 3 applications of 0·5–0·65% 666 insecticide dust in Sept.–Oct. reduced the percentage infection from 44 (untreated) to 14 in 1953 and from 15·2 to 6·6 in 1954. Yield increases for the two years were 87 and 33%. Spraying with 0·125% derris root extract or a suspension of pulverized derris root in 0·4% soap solution was slightly less effective but is recommended for late treatment as it leaves no odour on the plants.

Chiu (W.-F.), Chang (C.-T.), & Tao (K.-H.). **Varietal resistance of Brassica pekinensis Rupr. to bacterial soft rot.**—*Acta phytopath. sinica*, **1**, 1, pp. 61–69, 1955. [Chinese. Abs. from English summary. Received 1957.]

In inoculation trials for varietal resistance of Chinese cabbage to bacterial soft rot (*Erwinia aroideae*), none of the 87 varieties and lines from various parts of China

was immune. Types with a loose, cylindrical head or with greenish petioles were frequently less susceptible than those with a compact, globose head or with white, juicy petioles. Kaiynen consistently showed a high degree of resistance, while Tachingkou and Answenteng, though less resistant, were of better marketing value.

Chiu (S.-F.) & Yuen (C.-S.). **The rate of wound suberization of Chinese Cabbage in relation to resistance to the bacterial soft rot infection.**—*Acta phytopath. sinica*, **2**, 1, pp. 55–65, 5 fig., 1956. [Chinese. Abs. from English summary. Received 1957.]

Experiments in China showed that infection of Chinese cabbage by *Erwinia phytophthora* and *E. aroideae* increases with the age of the plant, as the suberization of wounded petioles takes 72 hr. after heading as against only 24 hr. in younger plants. The rate of suberization is also decreased by low temperature, continuous rain, and flooding, and also by low R.H. and deficiency of oxygen.

Horton (J. C.). **Radish mosaic viruses.**—*Diss. Abstr.*, **16**, 10, pp. 1783–1784, 1956.

At the University of Wisconsin the radish mosaic virus of Severin and Tomkins (RMV 1) [**31**, p. 43] and 5 other radish mosaic isolates (RMV 2–6) were compared with known strains of cauliflower virus 1 [cauliflower mosaic virus] (CBV) and turnip virus 1 [turnip mosaic virus] (CAV and CBRV) on a number of hosts at constant air temperatures of 16° and 28° C.

RMV 1 and 3 and CBV produced persistent vein-clearing and yellow and green vein-banding on radish and other hosts, and were restricted to Cruciferae; the symptoms on radish corresponded to those described by Severin and Tomkins but were distinct from those reported earlier by Tomkins [**18**, p. 427]. RMV 2, 4, 5, and 6, CAV, and CBRV produced prominent mottling and necrotic or chlorotic spots on both crucifers and non-crucifers, and could be distinguished from one another on certain tobacco varieties. The thermal inactivation point (in extracted sap heated for 10 min.) lay between 70–80° for RMV 1 and 3 and CBV, and between 60–65° for all the remaining strains. All were transmissible by *Myzus persicae* and *Brevicoryne brassicae*. RMV 1, RMV 3, and CBV did not immunize rape against either CAV or CBRV, but cross-protection against both strains in rape and against CBRV in *Nicotiana multivalvis* was effected by RMV 2, 4, 5, and 6.

It is concluded that the strain used by Severin and Tompkins was not the same as that described by Tompkins in 1939, but a strain of cauliflower mosaic virus. The properties of Tompkins's original virus would justify its provisional inclusion in the turnip mosaic virus group. Sylvester's suggestion of a third group, radish virus 1 [**33**, p. 398], can no longer be entertained.

Schlösser (L. A.), Koch (F.), & Bogen (T. von). **Ergebnisse eines Spritzversuches mit 'Brestan' gegen Cercospora beticola im Schwerbefallsgebiet Oberitaliens.** [Results of a spraying experiment with brestan against *Cercospora beticola* in the heavily infected region of Northern Italy.]—*Pflanzenschutz*, **9**, 8, pp. 122–123, 1957.

A tabulated report is given of spraying experiments against *C. beticola* on KW Zucca (Z) sugar beets in the Po Valley (described as the most heavily infected region in Europe) [**35**, p. 259], the results of which clearly demonstrated the superiority of brestan (V.P. 1940) [**36**, p. 541] at dosages of 1·8 or 3 kg./ha. to copper oxychloride (45–50 and 40% at 5 and 6·2 kg., respectively), and iron carbamate at 3 kg.

McClean (D. M.). **Effect of insecticide treatments of Beets on transmission of yellows virus by Myzus persicae.**—*Phytopathology*, **47**, 9, pp. 557–559, 1957.

Studies on beet yellows virus [**35**, p. 141] at the Northwestern Washington

Experiment Station, Mount Vernon, showed that viruliferous aphids feeding for 20-min. periods in successive transfers to insecticide-treated plants were not killed until they had fed for 80–100 min. and some continued to transmit until they were killed. The systemic insecticides thimet and demeton killed feeding aphids for 18–24 days after application and were translocated from sprayed to unsprayed leaves within 24 hr. Metacide had a greater residual action (12–16 days) than parathion (8–14) or malathion (6–10); none of these was translocated. Thimet 44-D applied to seed was not lethal to aphids on the seedlings 21 days later.

Foschi (S.). **Fave, Piselli e Fagioli.** [Broad Beans, Peas, and French Beans.]—*Progr. agric., Bologna*, **3**, 6, pp. 702–703, 1 col. pl., 1957.

Brief notes in popular terms describe the symptoms of *Ascochyta pisi* and *Botrytis cinerea* on peas, and of *Colletotrichum lindemuthianum* and a white mould due to an unidentified deuteromycete on French beans [*Phaseolus vulgaris*].

Davison (A. D.) & Vaughn (J. R.). **Effect of several antibiotics and other organic chemicals on isolates of fungi which cause Bean root rot.**—*Plant Dis. Reptr*, **41**, 5, pp. 432–435, 1957.

At the Wyoming Agricultural Experiment Station, Laramie, none of the 9 chemicals tested on plates and in soil against the fungi (3 *Fusarium*, 1 unidentified) causing root rot of *Phaseolus vulgaris* [**35**, p. 742] gave the desired degree of control, but several were promising, particularly vancide Z-65 (500 p.p.m.) and crag fungicide 974 (125 p.p.m.).

Zaumeyer (W. J.) & Thomas (H. R.). **New Snap and Pinto Beans resistant to several diseases.**—Abs. in *Phytopathology*, **47**, 7, p. 454, 1957.

A new green-podded bush snap bean [*Phaseolus vulgaris*], 1831–9, and a new dry bean, Columbia Pinto [*P. vulgaris*], have been bred by the U. S. Dept of Agric. in co-operation with the Washington and Idaho Agricultural Experiment Stations and are being released. The 1831–9 is immune from bean common mosaic, its New York 15 strain, and bean pod mottle viruses. In addition to the resistance of modern pinto beans, Columbia Pinto resists the New York 15 strain of bean common mosaic virus and several [unspecified] races of bean rust [*Uromyces appendiculatus*]. It is adapted to the irrigated districts of the Mountain States.

Baggett (J. R.). **Effects of genetic segregation in Phaseolus vulgaris on the symptoms induced by Bean yellow mosaic virus.**—*Phytopathology*, **47**, 6, pp. 365–368, 7 fig., 1957.

At Oregon State College, Corvallis, 267 families of the F_3 progeny of a cross between the bean (*Phaseolus vulgaris*) var. Great Northern (U.I. 31), resistant, and Blue Lake (O.S.C. 21), susceptible to [beet] curly top virus [**35**, p. 60] and bean yellow mosaic virus were inoculated with a pod-distorting strain of the latter virus [cf. **29**, p. 284]. The resulting very wide range of symptoms (both in form and severity) obtained in leaves inoculated both by abrasion and systemically were classified 75 days later and are described and tabulated. They emphasize the strong effects of genetic segregation on the reaction to infection by bean yellow mosaic virus, even within a uniform environment.

Crossan (D. F.), Lloyd (P. J.), Hyre (R. A.), & Heuberger (J. W.). **Control of downy mildew of Lima Bean.**—*Plant. Dis. Reptr*, **41**, 3, pp. 156–159, 1957.

At Clayton, Delaware, two applications of manzate at 2 lb./100 gal. within one month

of harvest and at an interval of 12 days, gave excellent control of downy mildew (*Phytophthora phaseoli*) on Thorogreen lima bean [*Phaseolus lunatus*: **36**, p. 370], infection being 0·4% and yield/acre 3,819 lb. as against 38% and 2,523 lb. for the untreated. Three unsprayed resistant lines, U. S. 155, 255, and 355, had 0·1, 0·02, and 0·03% mildew, respectively. At Newark infection was reduced from 34 to 1% by three applications of manzate; satisfactory results (2% infection) were also obtained with tank-mix zineb (2 quarts nabam+$\frac{3}{4}$ lb. zinc sulphate) and tribasic copper sulphate (4 lb.).

THAUNG (M. M.) & WALKER (J. C.). **Studies on bacterial blight of Lima Bean.**—*Phytopathology*, **47**, 7, pp. 413–417, 1 fig., 1 graph, 1957.

These studies of bacterial blight (*Pseudomonas syringae*) of Lima bean [*Phaseolus lunatus*: **34**, p. 339] made at the University of Wisconsin, Madison, to explain the sudden severe epidemics of the disease in Wisconsin have already been noticed in part [**36**, p. 744]. Greenhouse infection was readily obtained using an atomized bacterial suspension with or without humidity after inoculation. Contrary to general opinion the disease was found to be commonly present in the United States west of the continental divide and to be present on seed from these areas. The organism survived in Wisconsin soil for a year, but not through two winters.

Temperature tests showed 28° C. to be optimal for disease development, but when plants were exposed alternately by day and night to temperatures of either 16° or 28° it was found that the temperature at night determined the disease intensity regardless of what it was by day. In culture bacterial growth increased with increasing nitrogen, whatever the level of sucrose, though increased sucrose alone augmented growth to some extent.

COLEY-SMITH (J. R.) & HICKMAN (C. J.). **Stimulation of sclerotium germination in Sclerotium cepivorum.**—*Nature, Lond.*, **180**, 4583, p. 445, 1957.

In further studies at the University of Birmingham on *Sclerotium cepivorum* [**36**, p. 567], germination of sclerotia which had been buried in soil for 6 months and then placed between the roots of onion seedlings transplanted singly into tubes of soil averaged 60 to 92% whereas none or rarely up to 15% of the sclerotia germinated in the control tubes without onions. This stimulation was not dependent on contact with the root and was effective at a distance of up to 1 cm. in soil or sand. When sclerotia were placed on pricked onion roots germination was 100%; on undamaged roots it was 97·5% for sclerotia on the root tips, 47·5 between tip and base, and 57·5 on the base of the bulb. Water extracts from roots of onion, shallot, and leek also stimulated the germination of sclerotia in soil, but distilled water and root extracts from cabbage, brussels sprouts, and barley had no effect.

YAMAGUCHI (M.), MINGES (P. A.), & KNOTT (J. E.). **Brown checking of Celery, a symptom of boron deficiency. II. The effect of high nitrogen and high potassium fertilization.**—*Proc. Amer. Soc. hort. Sci.*, **69**, pp. 448–454, 1 graph, 1957.

In a further study in this series (*Proc. Amer. Soc. hort. Sci.*, **68**, pp. 318–328, 1956) the application of nitrogen or nitrogen+potassium to celery growing in boron-deficient soil in two field locations in California resulted in significantly more brown checking (due to boron deficiency) than in the controls. Applications of potassium alone or with gypsum did not affect the incidence of the disorder.

SINCLAIR (J. B.), GEIL (P. H.), & KAESBERG (P.). **Biophysical studies of wild Cucumber mosaic virus.**—*Phytopathology*, **47**, 6, pp. 372–377, 4 fig., 4 graphs, 1957.

Further studies at the University of Wisconsin [cf. **36**, pp. 172, 299] showed that when partially purified wild cucumber [*Echinocystis lobata*] mosaic virus was

examined in an ultra-centrifuge two Schlieren peaks were observed, suggesting that two components were present. Such virus suspensions layered on sucrose density-gradient columns gave two opaque layers after high-speed centrifugation. Details are given of the two layers, of which the bottom was infectious, the upper not.

KLINKOWSKI (M.) & OPEL (H.). **Die Gurke (Cucumis sativus L.) als Wirtspflanze des Rhabarber-Mosaik-Virus.** [The Cucumber (*Cucumis sativus* L.) as host plant of the Rhubarb mosaic virus.]—*Z. PflKrankh.*, **64**, 7–10, pp. 445–451, 7 fig., 1957. [English summary.]

For a number of years rhubarb in central Germany has been affected by a virosis causing foliar mosaic and necrosis. Transmitted mechanically to Delikatess cucumber plants [cf. **33**, p. 402] in a recent series of experiments covering a 2-year period, the virus induced chlorosis of the leaves and stunting due to marked shortening of the internodes, accompanied in severe cases by death of the growing point.

A bluish fluorescence appeared in the petioles, leaf veins, and stunted portions of shoots, as well as in transverse sections of necrotic stem tissue examined in ultra-violet light [cf. **27**, p. 272]. Two bluish-fluorescing substances, virtually absent from healthy material, were extracted from infected plants in a solvent mixture of butanol-glacial acetic acid-water (4:1:5) and separated by paper chromatography.

TOUZÉ (A.). **Nutrition azotée de Colletotrichum oligochaetum Cav.** [Nitrogenous nutrition of *Colletotrichum oligochaetum* Cav.]—*C.R. Acad. Sci., Paris*, **245**, 13, pp. 1076–1079, 1957.

On a synthetic medium with added thiamine (100 μg./l.), biotin (5 μg./l.), and nitrogenous compounds at a uniform rate of 0·42 g./l, *C. oligochaetum* [*C. lagenarium*: **15**, p. 467], a very widespread agent of melon anthracnose in S.W. France [**35**, p. 635], proved capable of assimilating nitrogen from diverse sources, e.g., ammoniacal salts, amides, uric acid, and ureides, particularly uroxanic acid. The mechanism of utilization of the last-named compound is described.

ARK (P. A.) & THOMPSON (J. B.). **Control of downy mildew of Cucumber with antibiotics.**—*Plant Dis. Reptr*, **41**, 5, pp. 452–454, 1957.

At the University of California, Berkeley, sporangial germination in *Pseudoperonospora cubensis* [**35**, p. 810] was completely inhibited by aureomycin, gramicidin S (both 500 p.p.m.), filipin, patulin (both 100), and tyrothricin (100 and 500). Sprayed on cucumber plants 1 min. before inoculation with a zoospore suspension, amphomycin, mycostatin, terramycin (all 500 p.p.m.), patulin, polymixin (both 100), streptomycin (1,000), nuclay dust, and tyrothricin (100, 300, and 500) gave at least 87% control of the disease. Spraying after inoculation appeared equally effective.

CONROY (R. J.). **Fusarium wilt of Rockmelon (Cucumis melo L.) in New South Wales.**—*J. Aust. Inst. agric. Sci.*, **23**, 2, pp. 152–154, 1957.

Evidence obtained in a field trial at Brookvale, N.S.W., indicated that the Delicious 51 rock melon is resistant to *F. oxysporum* f. *melonis* [**35**, p. 343] under conditions inducing severe infection of susceptible varieties. Only 17·8% loss occurred in seedlings and plants of Delicious 51, as against 96% in Bender's Surprise, 92·3% in Hales Best, and 82·5% in P.M.R. 45. Half the loss in Delicious 51 occurred as a seedling rot, and it is possible that low temperatures in the first half of the test period may have induced breakdown in the field resistance of some of the older plants. Delicious 51 is, however, susceptible to *Erysiphe cichoracearum*, a major disease of rock melons in the coastal areas [**33**, p. 211].

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